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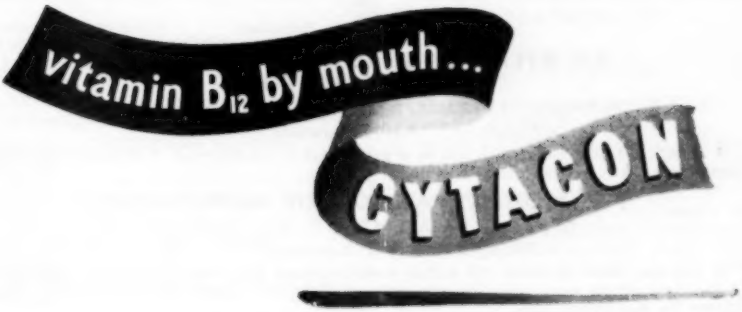

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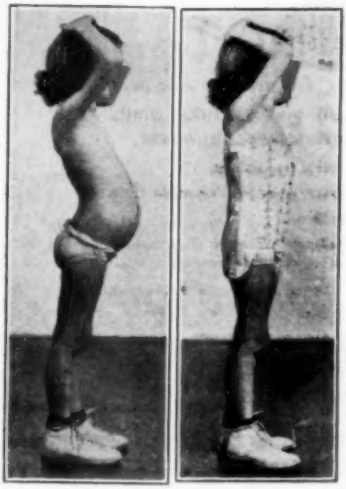

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In Sycosis, Impetigo & Staphylococcal Skin Infections and allied conditions

Long recognised by skin specialists as a specific for sycosis "QUINOLOR" Compound Ointment, Squibb, possesses remarkable antibacterial and tissue-healing properties. Now an established favourite for the speedy relief of superficial lesions in sycosis barbæ and vulgaris, tinea sycosis, impetigo, epidermophytosis of the toes, etc. Varicose ulcers and bed-sores are also among conditions which are reported to have derived benefit from the tissue-repair promoting properties of the chlor-hydroxy-quinolin as well as the prolonged liberation of oxygen from the benzoyl peroxide contained in the soothing antiseptic base of this preparation.

Compound **'QUINOLOR'** Ointment

1 oz. and 16 oz. jars

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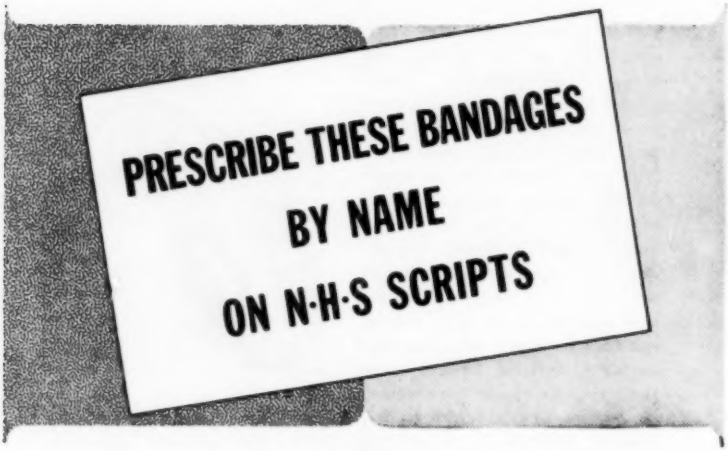
Viscopaste TRADE MARK and Ichthopaste TRADE MARK

BANDAGES



Viscopaste and **Ichthopaste** bandages conform fully to the Drug Tariff specification for Zinc Paste Bandage (Drug Tariff) and Zinc Paste and Ichthammol Bandage respectively. They are recommended as adjuvants in the supportive treatment of varicose veins and their complications by elastic adhesive bandaging, and as a support in the after-treatment of below-knee fractures.

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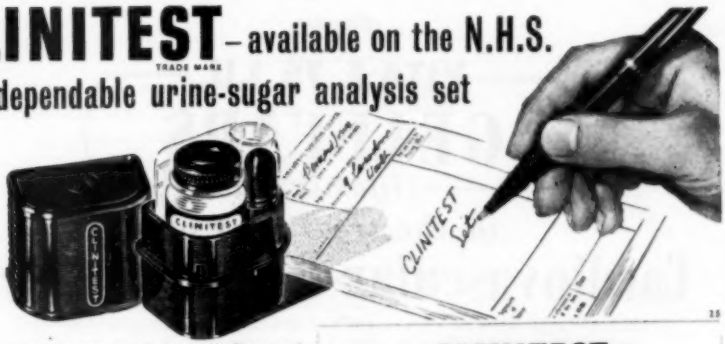

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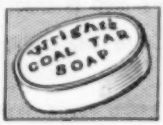
It's good practice to bring Wright's Coal Tar Soap to your patients' notice. A soap that has been held in such high esteem by the medical and nursing professions for nearly three-quarters of a century merits your consideration.



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A concentrated preparation of the uncoagulated juice of liver, fortified with iron and glycerophosphates.

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After many bacteriological experiments this mask was designed to arrest all droplets from the mouth and nose, and so to prevent contamination during operation. The "Cestra" Mask consists of 4 layers of fine dental gauze. It fastens securely under the chin, has an air gap at the sides, is comfortable to wear for long periods and may be easily sterilized.

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DESPITE half a century of painstaking research, there is still no unanimity of opinion regarding the causation of rheumatic diseases. Treatment is therefore necessarily symptomatic and directed to the relief of pain.

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Reports of the successful treatment of hundreds of rheumatic patients have appeared recently in leading medical journals, recommending Lloyd's Adrenaline Cream as the most satisfactory preparation.

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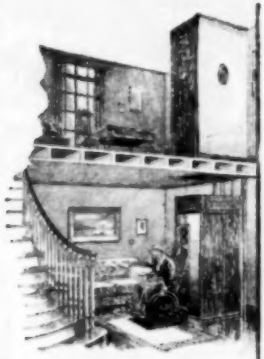
no more cares about stairs !



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Aminacrine Hydrochloride	0.1%
Hexylresorcinol.	0.1%
Phenylmercuric Nitrate	0.004%

In a Sterilised glyco-gelatin base.

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Gravitational Ulcers, Pressure Sores, Carbuncles, Boils, Wounds, Burns. As a post-operative dressing in Rectal operations. In the preparation of tissue surfaces for skin grafts.

At present available only to Hospitals, Private Practitioners, and Medical Departments in Industry.

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ROTER promptly abolishes subjective manifestations such as pain, discomfort and nausea.

Accelerates healing, without undue dietary restrictions.

Provides a true ambulatory treatment which is entirely free from the risk of unpleasant side-effects.

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ROTERCHOLON gives a new and remarkably efficient approach to the treatment of cholecystitis, cholangitis and associated conditions.

ROTERCHOLON has an unusually potent choleretic and cholagogic action.

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Acetarsol Combination *(active against Trichomonas and associated infections).*

Prescribe "Kylon applicator set" stating type of jelly, e.g. "Kylon Acetarsol applicator set—use one application nightly (or according to requirements)."

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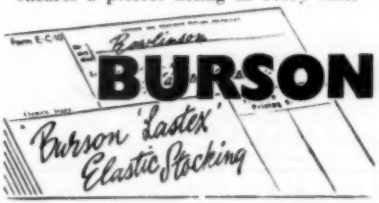
Burson Elastic Stockings are made from the finest 'Lastex' yarn to give them a special two-way stretch. And the complete size range of Burson Hosiery ensures a perfect fitting in every case.



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INDICATIONS: Dermatophytoses, Tinea Pedis, Tinea Cruris and Monilia infections.

Calped Cream: Containing Parachlorophenylether 0.5%, Phenylmercuric Nitrate 0.004%, in a Bentonite Cream base. Available in 1 oz. Jars.

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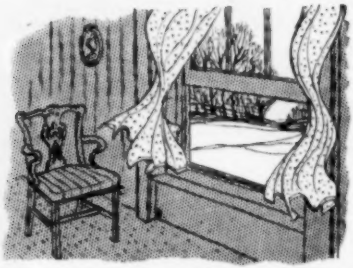

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NASAL OBSTRUCTION and increased secretion are undoubtedly the most distressing symptoms of the common cold. A prime factor in providing for the patient's comfort therefore is the restoration of normal ventilation.

'ENDRINE' *is a well-tried preparation which contains ephedrine in concentrations harmless to the mucosa yet able to achieve ventilation for several hours.* By its use the patient may be relieved at once of his symptoms and normal function can be restored.

'ENDRINE' is available in three varieties: *Ordinary, Mild and Isotonic.*

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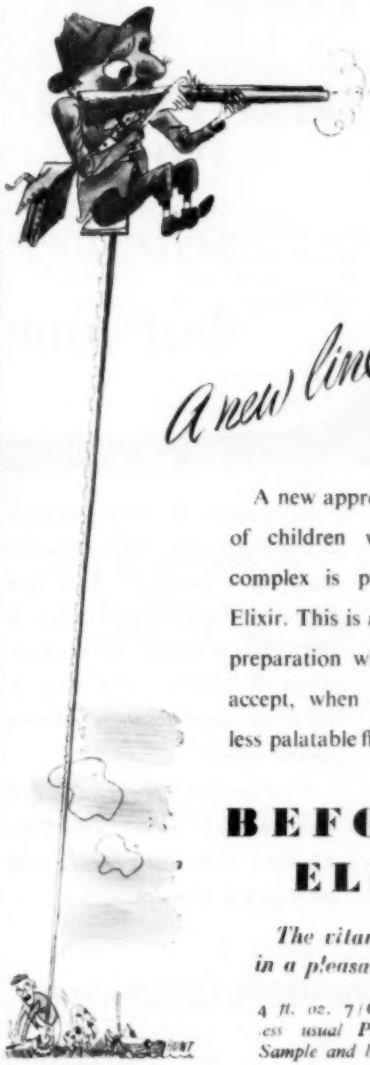

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All V.L. specialities are prescribable under the N.H.S. The cost is in no case greater, and in some cases less, than the official proprietary equivalent. There is no official equivalent of some V.L. specialities.

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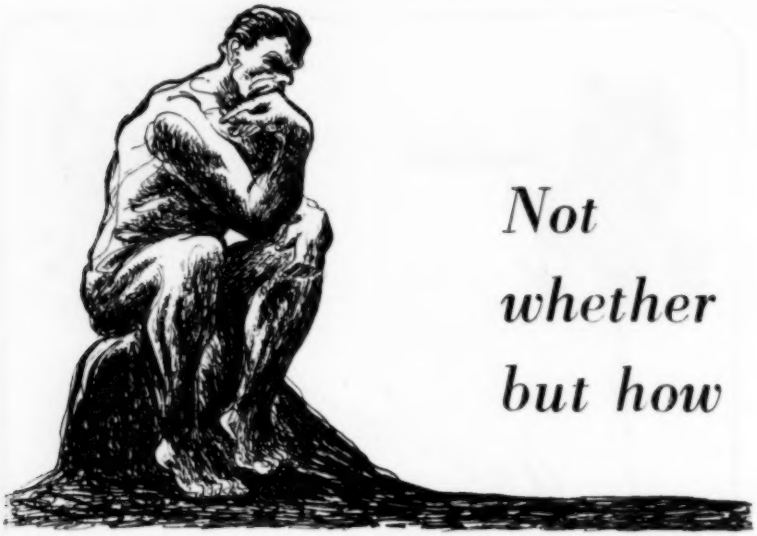

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The preparation should not be too bulky, nor cause gastro-intestinal upset, yet it must disintegrate quickly and produce maximum hæmatopoietic response.

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'PLASTULES' *are available in four varieties: Plain:* with *Liver Extract:* with *Folic Acid:* and with *Hog's Stomach.*

'PLASTULES' *Hæmatinic Compound*

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yeast extract

Obtainable from Chemists and Grocers

Special terms for packs for hospitals, welfare centres and schools

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W-DIETHYLAMINO—2·6—DIMETHYLACETANILIDE

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THE NEW LOCAL ANAESTHETIC

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Premature babies do very well on *FRAILAC*.

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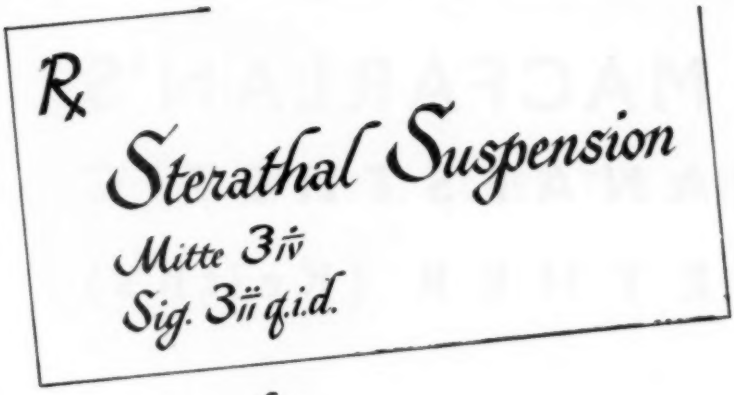

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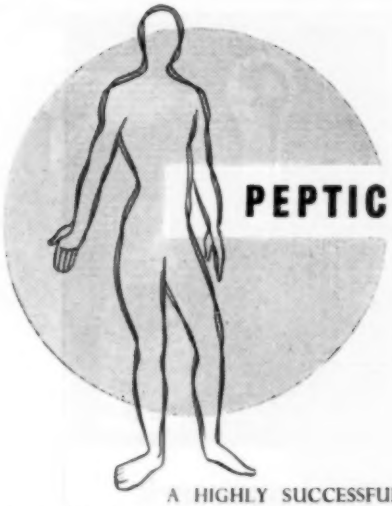

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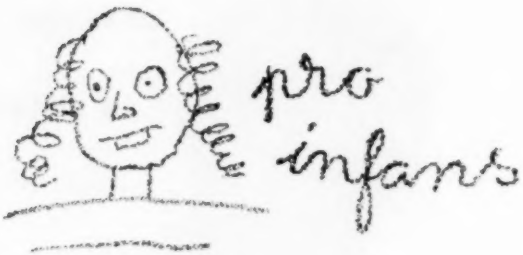

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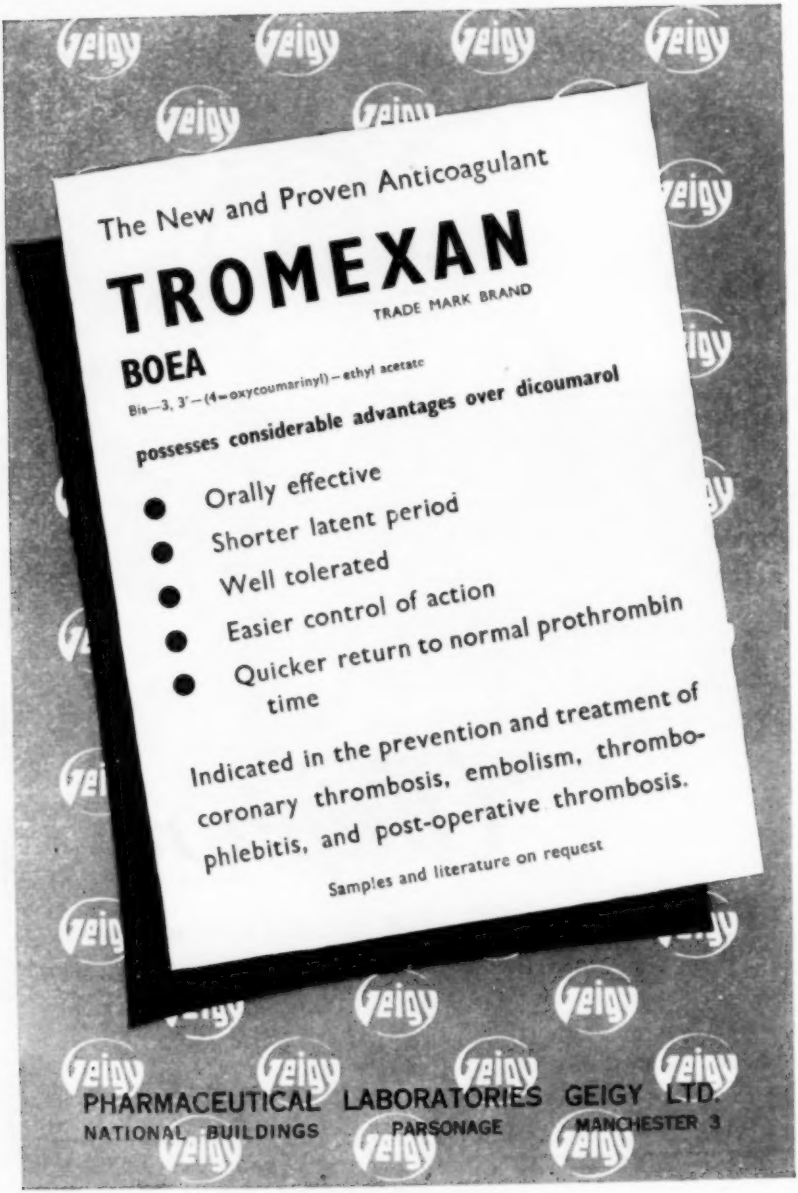
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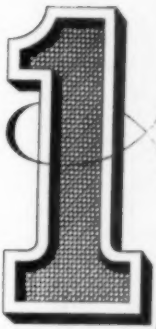

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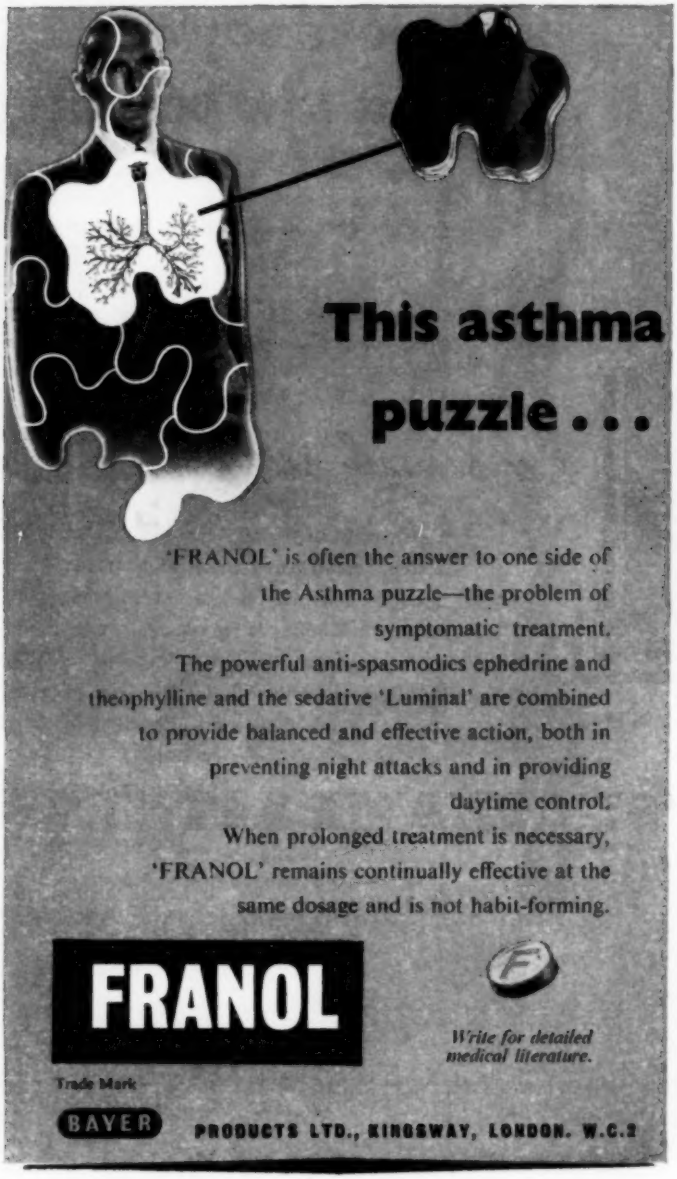
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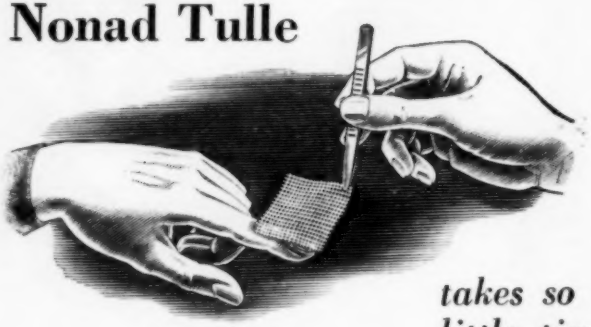

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THE PRACTITIONER

No. 999 SEPTEMBER 1951 Volume 167

THE MONTH

PERHAPS one of the most striking advances in medicine since the foundation of *The Practitioner* in 1868 is the extent to which it is now possible to protect the community against disease by means of artificial immunization. It is for this reason that we have chosen 'immunization in general practice' as the subject of the symposium in this, the precursor to our thousandth issue. To the readers of our first issue the mere suggestion that smallpox, diphtheria and enteric fever could be brought under control by such methods would have sounded as the dream of a delirious Utopian. Today we accept these facts as a matter of course and are somewhat impatient because equally satisfactory results cannot be guaranteed in the case of whooping-cough and measles. In the case of the former the position is rapidly improving, but it is clear that much requires to be done before an effective immunization against measles can be assured. War-time experience has demonstrated the efficacy of immunization against tetanus, but its practical application in civilian practice presents a difficult administrative problem. All these problems are dealt with in the symposium, as well as the increasingly important one of the requirements of immunization for those who travel by air.

No. 999

IT is a fortunate coincidence that our thousandth issue should fall to be published in October, as tradition has now established that the issue for this month every year should be devoted to 'recent advances in treatment'. To mark the occasion we are not only publishing a larger number, but we have also chosen our contributors from among the leading members of the profession in the United States of America, as well as from among those in this country. As can be seen from the advanced list of contents on p. lxviii, we have been fortunate to obtain for this number the services of Dr. Donald Balfour of the Mayo Clinic, Professor Samuel Feinberg, who has established himself as one of the authorities on the clinical uses of the antihistamines, and Professor W. O. Thompson, one of the leading endocrinologists in the United States. 'Current Therapeutics' will be devoted to cortisone, one of the most important advances in medicine of recent years, which will be reviewed by Professor Freyberg, who has had wide experience of its use in the United States. The background against which the dramatic advances in medicine have taken place during the last eighty years will be reviewed in

No. 1000

its different aspects by Sir Henry Dale, Sir Henry Bashford and Dr. W. N. Pickles. The reminiscent mood of Sir Henry Bashford and Dr. Pickles will strike many a nostalgic note in the hearts of our older readers, as they bring to mind the days when medicine was still an art and the general practitioner was truly the family doctor.

Professional Freedom

In the Croonian Lectures to the Royal College of Physicians, which have now been published (*Lancet*, 1951, **ii**, 115, 171), Dr. T. F. Fox provides a masterly review of one of the most vital problems of the day —professional freedom. In the hurly-burly of the last three years there has been an inevitable tendency for the energies of the profession to be occupied in striving to ensure that the conditions of practice should not fall below a certain minimum level. The result has been that some of the major issues involved in the initiation of the National Health Service have not received the attention they should. As Dr. Fox points out, 'sooner or later the work of doctors had to be organized, with unavoidable risk to their freedom', and these are the risks which he analyses so shrewdly and wisely in these lectures, and at the same time suggests how they can be avoided. Our rôle in the N.H.S. is 'to minister, not administer', and in so doing we are not employees of the State 'for the people to whom the doctor ministers are his patients, not an employer'. And, as he goes on to point out, 'above all other members of the profession, it is essential that the general practitioner should not regard himself as the servant of anyone other than his patient'. One of the major risks to the freedom of the general practitioner today is the number of patients on his list: 'When too many patients come through the surgery door, professional freedom flies out of the window: lacking time the doctor is no longer free to do what he thinks right'. Though devastating in his criticism of the pernicious effect of State control upon the practice of medicine, he stresses equally trenchantly that 'the outcome rests less on what we claim than on what we *are*. To justify their liberty of judgment members of our profession must be people who can be trusted to use that judgment in the interest of their patients—and also people whose judgment is worth using'. Further, he reminds us that 'we are told that the democracies cannot survive unless their rulers can count on continual help from the professions; and certainly the professions cannot remain free if the democracies perish'.

T.B. Colloquium

The Medical Research Council of Ireland are to be congratulated on the success of the colloquium on the chemotherapy of tuberculosis which they organized in Dublin this summer. To the clinician the most significant feature of the meetings, dominated as they were by chemists and pharmacologists, was the light they threw on the tremendous progress that has been made of recent years in our understanding of the intricate chemistry and metabolism of the tubercle bacillus. The logical approach to the search for a specific anti-

tuberculosis drug may still be a dream of the future but, in spite of the tinge of pessimism expressed by one research chemist who referred to the 'miss and miss' method of searching for such a remedy, it was clear that there were grounds for cautious optimism in this, one of the most fascinating fields of modern research. Three outstanding contributions epitomized the range of the proceedings. Dr. E. Lederer, the director of research of the National Centre for Scientific Research in Paris, read a masterly paper on 'the chemistry and biochemistry of the tubercle bacillus'. Dr. Vincent Barry, the director of laboratories of the Irish Medical Research Council, illustrated 'an organic chemist's approach to the chemotherapy of tuberculosis' by a brilliant review of the work of his own department in this field, in the course of which he appealed to the clinicians for their help in solving the difficult problem of how to facilitate the critical step between animal and human experiments. To many the colloquium provided the first opportunity of hearing Professor G. Domagk tell his own story of the discovery of the antituberculosis activity of the thiosemicarbazones and, though he may not have had the detailed statistical data which the Medical Research Council has taught those of us in this country to expect in such matters, there were few who were not impressed by his account of his work. As one member pointed out in the subsequent discussion, it is given to few men to discover two new groups of potent chemotherapeutic substances, which is what Domagk has done by his discovery of the antibacterial activity of the sulphonamides—and now the thiosemicarbazones.

The Doctor's Day

In his inaugural presidential address to the Royal Statistical Society, which has now been published (*J. Roy. Statistical Soc.*, 1951, **114**, Pt. 1), Professor Bradford Hill discusses certain aspects of the inquiries which he has carried out during the last decade into the services given to insured persons by general practitioners before the 1939-45 war, and the remuneration they and specialists received. Much of this information was published in the two Spens' reports, but many sidelights on pre-war general practice are brought out in this address which, not unnaturally, were omitted from the evidence given to the Spens' Committee, as they were scarcely relevant to the issues before that committee. For instance, the maximum number of attendances of insured persons at doctors' surgeries was always on a Monday (19.9 to 21.4 per cent. of the total), and the next busiest day was Saturday, followed by Friday, Tuesday, Wednesday and Thursday. On Sunday the attendances were only a little more than 1 per cent. of the total. The daily distribution of visits to patients in their homes was somewhat different, although Monday still headed the list—the order here was Monday, Friday, Tuesday, Wednesday and Saturday, Thursday, Sunday. A higher proportion of visits, than attendances, was made on Sunday—just over 6 per cent. An analysis of 'special services' rendered per doctor per week gave the following results: special, extra or night visits, 2.77; operations, major or minor 3.0; injections

2.12; number of N.H.I. certificates issued 34.1; number of reports and correspondence made 6.02. It would be interesting to know how the figure of 34 for certificates issued compares with the 1951 figure. It is not only for these interesting facets on the work of the practitioner that this address should be read. It is an admirably clear exposition of the application of statistics to the elucidation of practical everyday problems. In this address Professor Bradford Hill demonstrates brilliantly how statistics can be understood with only a minimal knowledge of mathematics.

Three Centenaries

LINKED by the accidents of birth and death, three colourful personalities in medicine have their centenaries this month. John Kidd, who died on September 17, 1851, lives in the memory of his profession as one of its most versatile members. Born in 1775, he studied medicine at Guy's Hospital and, after qualifying in 1801, was appointed Reader in Chemistry at the University of Oxford, and two years later the first Aldrichian Professor. Physician to the Radcliffe Infirmary, in 1822 he became Regius Professor of Medicine. Keenly interested in geology and in mineralogy, he was elected a Fellow of the Royal Society and published in the *Philosophical Transactions* for 1815 an 'Essay on the Spontaneous Production of Salt-Petre'. His Bridgewater Treatise, 'On the Adaptation of External Nature to the Physical Condition of Man', went through six editions. From 1834 until his death he was Keeper of the Radcliffe Library.

Born two days before Kidd's death, Sir William Whitla likewise combined medical skill with a knowledge of chemistry. After serving an apprenticeship with a firm of dispensing chemists in Belfast, he studied medicine at Queen's College. Appointed physician to the Royal Victoria Hospital before he was thirty, his name became known to generations of practitioners through his 'Elements of Pharmacy, Materia Medica and Therapeutics' and his 'Dictionary of Treatment'. His early chemical training, wide clinical experience, and gift for lucid exposition made these books deservedly popular. As Professor of Materia Medica his lectures owed their dramatic style to his love of English literature, particularly of Shakespeare. The Whitla Medical Institute in Belfast, which he had built in 1902—the year of his knighthood—to house the Ulster Medical Society, is a worthy monument to a generous and remarkable man.

On the other side of the Atlantic another man, destined to make medical history, was born two days before Whitla. Walter Reed obtained his M.D. from the University of Virginia before his eighteenth birthday and six years later began his distinguished army career. When yellow fever broke out among American troops stationed in Havana, he was appointed chairman of a commission of investigation. In the course of a long and patient inquiry which cost the life of his colleague Jesse Lazear, Reed conclusively showed the *Stegomyia fasciata* mosquito to be the transmitter of the disease. He died on November 22, 1902, after an operation for appendicitis—a poor man.

SMALLPOX IMMUNIZATION

By E. T. CONYBEARE, O.B.E., M.D., F.R.C.P.
A Senior Medical Officer, Ministry of Health.

'A provoquer, au moyen d'un virus-vaccin, une maladie bénigne qui préserve d'une maladie mortelle par l'application de cette loi générale que les maladies virulentes ne récidivent pas.'—Pasteur.

It was in 1881, about half way between the announcement of Jenner's great discovery and the present time, that Pasteur so aptly stated the principle on which most of the artificial immunization done against virus diseases still rests. In this country, smallpox, now only from time to time imported from abroad and no longer continuously prevalent, remains a 'mortal disease', seizing but few victims yet exhibiting in its capacity to destroy them all its original ferocity. The only sure protection against it is still 'to provoke, by means of a virus vaccine, a benign malady', in other words—to vaccinate.

The chief purpose of this article is to consider vaccination and other possible means of immunization against smallpox in relation to general practice. The situations in which a general practitioner is likely to be requested either to vaccinate or to advise about immunization against smallpox can be dealt with under two main headings.

URGENT IMMUNIZATION

Recent experience shows that the present widespread apathy about routine infant vaccination is in great contrast to the reaction of the public to an outbreak of smallpox. As soon as the presence of a case of smallpox becomes generally known, all the general practitioners in the neighbourhood of the outbreak are inundated with requests either to vaccinate or to advise about vaccination. In such circumstances practitioners are, however, entitled to discriminate and, in consultation with the local medical officer of health, to select for prior attention household or other direct contacts of the initial smallpox case. All persons either known to have been exposed, or likely to have been exposed, to a case of smallpox should be urged to get vaccinated or re-vaccinated with as little delay as possible. Vaccination done on the day of exposure to infection, or soon afterwards, will sometimes prevent, and will usually mitigate, an attack of smallpox, but the longer the delay the less the time available for immunity to develop, and little can be expected of vaccination unless it is done on or before the fourth day after exposure to infection.

Another means of immunization which ought to be considered, as well as vaccination for the protection of smallpox contacts who were unvaccinated at the time of repeated exposure in circumstances favourable to infection (e.g. residence in the same household as an unrecognized case of smallpox), is the use of a specific human anti-serum or immune globulin in a manner similar to that now employed for the prophylaxis of measles. From time to

time, small amounts of specific human anti-serum and immune globulin active against variola virus are prepared at the Central Laboratory of the Public Health Laboratory Service at Colindale. This material would probably be made available through local health departments for use in suitable circumstances, but there is to date no published evidence of its value.

Individuals resident in the affected neighbourhood but not either known, or likely already to have been exposed to infection come within a second category of prospective subjects for vaccination or re-vaccination in a local outbreak of smallpox. Within this category also there are doctors and others who through occupation or special circumstances run a definite risk of exposure to possible further smallpox cases; such persons should, of course, be vaccinated or re-vaccinated without delay.

Smallpox imported from abroad has broken out in at least 30 different local areas of England and Wales since the end of the last war. The recorded experience of these incidents shows that it is usually possible to bring an outbreak of this disease under control without recourse to indiscriminate and hasty vaccination of large numbers of the local population. No one who believing himself or herself to be threatened with smallpox demands vaccination should be refused (with the possible exception of those who suffer from chronic skin conditions like eczema), but in the early stages of an outbreak the local facilities for vaccination are usually limited and it is both wise and reasonable to use them in a way that is most likely to do good, that is to say, in as close a relation as possible to the probable lines of spread of the disease. Vaccination on this so-called 'expanding ring' principle appears to have given excellent results in the control of recent outbreaks of smallpox, e.g., at Brighton early this year. Good cooperation between general practitioners and the local public health department is essential for the effective application of this selective form of vaccination to a town or district threatened with smallpox.

For all vaccination or re-vaccination done in situations of urgency the technique employed should use at least two skin areas so as to minimize the risk of failure to take in susceptible persons (see p. 221).

NON-URGENT IMMUNIZATION

It takes at least a fortnight, possibly longer, for the immunity against smallpox conferred by a successful primary vaccination to become fully effective. There is therefore likely to be considerable advantage to the individual in doing a first vaccination before exposure to smallpox has either already occurred or is likely to be imminent. There are, moreover, probably other advantages to the individual if the time and also the place of primary vaccination can be selected at leisure. It is likely, for instance, that in this way the small but none the less appreciable complication rate of primary vaccination can be minimized.

Infants.—By the repeal of the Vaccination Acts consequent on the beginning of the National Health Service in 1948, the law on vaccination has reverted to the position which held good between the time of Jenner's discovery and 1853. Then, as now, infant vaccination was officially encouraged but not compulsory. After 1853, the vaccination of infants was compulsory for forty-five years, and then for fifty years up to 1948 it was, in fact, largely optional, owing to the 'conscience clause' included in the Act of 1898. When the Vaccination Acts were repealed in 1948, about 40 per cent. of the children in this country were being vaccinated during the first year of life. The latest figures available to the Ministry of Health show that the proportion thus vaccinated in England and Wales is now only about 25 per cent. It must therefore be concluded that the routine application to infants of a procedure by which, as none can doubt, it is possible to confer an absolute protection against smallpox for several years, and a considerable degree of protection for much longer, is steadily becoming less popular.

Opinions differ as to whether this recent decline in the routine vaccination of infants substantially increases the risk of smallpox again becoming epidemic in this country, and warrants a more vigorous public policy on vaccination, or even the re-introduction of legislation to make it compulsory. This difference of opinion, however, should not affect the decision about the vaccination of individual infants. Primary vaccination at school age or in adult life, especially when done urgently in face of an emergency, has many disadvantages for the individual. Whatever the site or technique used a certain amount of local reaction is unavoidable, and physical activity at work or play is likely to increase the severity of this local reaction, as well as to predispose in a small but appreciable measure to serious complications such as septicæmia or encephalomyelitis. It should be remembered that although in this country outbreaks of smallpox due to accidental importation from abroad are now rare, there is no guarantee that this happy state of affairs can be maintained or that smallpox will not be used as a biological weapon against our civilian population in a future war. If at the same time it is considered that military service, or necessity to travel abroad, or taking up special professions like medicine and nursing, is certain to make immunization against smallpox obligatory for many in adolescence or later, it will be seen that, quite apart from its contribution to the protection of the community against epidemics, the routine practice of primary vaccination in infancy has many real advantages and hardly any disadvantages for the individual child.

Primary vaccination is probably safest and least troublesome when done between the third and sixth month of life. At this age any passive immunity to vaccinia transferred from the mother *via* the placenta has probably been lost, the feeding habits have become stabilized and the physical activity of the child is readily controlled, so that a basic immunity to smallpox is

readily conferred while the severity of the local and general reaction involved in the process is the least possible.

Schoolchildren.—Only the re-vaccination of children of this age is encouraged by the Ministry of Health. The ideal is probably re-vaccination on entering, and again on leaving, school. Severe local reactions and complications are uncommon at this age provided primary vaccination done in infancy or later has already been successful. The routine vaccination of infants would probably contribute a great deal more to the protection of the community against local outbreaks and the spread of smallpox if it was supported by at least one routine re-vaccination of children during the school years.

The routine *primary* vaccination of children of school age has been officially discouraged since 1927. It seems to be almost certain that at this age, when physical activity is apt to be excessive or difficult to control and the common infections of childhood are being encountered, encephalomyelitis, though rare, is a relatively more frequent complication of primary vaccination than at other ages.

Travellers.—For many travellers a certified vaccination or re-vaccination will be obligatory by reason of the immigration laws and regulations of the country to which they are going. For others, immunization against smallpox (not always the same thing as certified vaccination) will be essential for their own protection.

The vaccination, and in particular the *primary* vaccination, of persons of all ages who are travelling to eastern countries where smallpox is endemic, should be undertaken with as much care as the urgent vaccination of actual contacts of smallpox, using a two skin area technique that will minimize the risk of failure in susceptible individuals.

The certificate of vaccination which has current international acceptance for travellers is valid for three years from the date of vaccination, after which a fresh certificate obtainable by undergoing re-vaccination is necessary.

Special occupations.—All doctors, all nurses, and most members of the staffs of local health departments should be immunized, and regularly re-immunized, against smallpox. Re-vaccination every three years as a routine, and also on actual or prospective contact with smallpox cases, should be the general rule for persons in these occupations, which carry an extra risk of exposure to smallpox.

A Ministry of Health circular relating to the protection by vaccination of hospital staff other than doctors or nurses recommends re-vaccination every three years of all who are liable through their work to be exposed to smallpox, and mentions that this routine immunization should be carried out by the employee's own doctor if the employee so desires.

Primary vaccination at school age, or later, should not be made a condition of entry to residential institutions or civilian occupations when there is no special risk of exposure to smallpox.

PRACTICAL ASPECTS

Each year in the average doctor's practice there will probably be about 30 to 35 infants under one year for whom primary vaccination ought to be considered, and about twice as many school children at an age suitable for routine re-vaccination. There will also be casual demands for vaccination from intending travellers or from those engaged in occupations carrying a special risk of exposure to smallpox. Thus, quite apart from demands for urgent vaccination resulting from local or other outbreaks of smallpox which may or may not be encountered, what may be termed the 'potential vaccination load' for the average general practitioner is probably about 150 vaccinations per annum. If, in fact, every general practitioner in England and Wales carried out vaccination regularly on this scale, the total vaccinations done annually would be at least three million. The National Health Service records show, however, that in England and Wales the actual total of vaccinations done in 1950 was just under 300,000.

All doctors, whether providing general practitioner services under Part IV of the National Health Service Act 1946 or not, are now entitled to arrange with the local health authority for the area in which they practise (that is, the County Council or County Borough Council) to vaccinate their registered or other patients against smallpox under Part III of the Act. A fee, at present five shillings, is paid by the local health authority to the doctor for each record of a vaccination carried out under these arrangements, and government vaccine lymph for the purpose is supplied at the doctor's request through the nearest regional laboratory of the Public Health Laboratory Service. A doctor providing general practitioner services under Part IV of the Act is not entitled to claim fees for vaccination from his registered patients, but he can charge these patients for certificates of such vaccination, e.g., the certificate in the internationally agreed form required when travelling to or through certain countries.

VACCINE LYMPH

All lymph at present obtainable in this country is subject to control by the regulations (made in 1944 under the Therapeutic Substances Act of 1925) which lay down satisfactory standards of manufacture and bacterial content. The lymph now being issued by the government through the Public Health Laboratory Service is derived from sheep. The virus which it contains is probably an attenuated form of variola virus and not a 'cowpox' virus. Carefully stored and properly applied this lymph, and also the various makes of calf lymph which are sold in this country, will give a high proportion of satisfactory and trouble-free results. The prescription of a proprietary brand of lymph on form E.C.10 with a view to its use for National Health Service vaccinations, instead of the lymph issued through the Public Health Laboratory Service, has no obvious advantage either to patient or doctor.

Any lymph stored at a temperature below 10° C. but above freezing point, i.e., on or in the ice-making compartment of an ordinary domestic refrigerator, should remain potent for at least a fortnight. Kept in the dark and away from any source of heat it can usually be relied upon for up to a week. At the higher temperatures of summer, or if unduly exposed to light, lymph may lose its immunizing activity in a day or two.

CONTRAINDICATIONS

Before doing a primary vaccination it is important to inspect the subject for evidence of any *chronic skin disease*. Children or adults who exhibit obvious signs of chronic eczema should not be vaccinated except for urgent reasons. In the event of their having already been exposed to smallpox, instead of vaccinating such persons consideration ought to be given to inoculating them with the specific anti-variola immune globulin already referred to as being available from the Public Health Laboratory Service in certain special circumstances. Sufferers from chronic eczema, either when vaccinated or exposed to recently vaccinated persons, tend to develop generalized vaccinia in an extremely severe form, with a case mortality which is probably as great as that of smallpox. Such persons should therefore be carefully excluded from contact, e.g., in the same household with anyone having a local reaction to primary vaccination in the vesicular or pustular stages. A history of occasional attacks of urticaria, hay fever, asthma, or other so-called allergic diseases is not a valid contraindication to primary vaccination when urgent or obligatory.

Infections.—In the presence of a septic skin condition, and of any acute febrile condition, primary vaccination or re-vaccination should, whenever possible, be postponed. A history of recent exposure to one or other of the common infectious diseases of childhood, e.g. measles or whooping-cough, is also a good reason for the postponement of routine vaccination.

Pregnancy at any stage is not a contraindication to urgent or obligatory vaccination. A careful investigation done in New York in 1947 failed to show any evidence of association between congenital abnormalities and vaccination.

It is unlikely that the limited connexion recently shown to exist between *poliomyelitis* and immunization against diphtheria also exists between poliomyelitis and vaccination. However, in any area where, by reason of the prevalence of poliomyelitis, immunization against diphtheria has been temporarily suspended on the advice of the local medical officer of health, it would obviously be unwise to continue routine infant vaccination. A local or general prevalence of poliomyelitis, however, is not a good reason to abandon or to postpone urgent and obligatory immunization against smallpox.

Before primarily vaccinating intending travellers a doctor should inquire whether an obligatory *inoculation against yellow fever* has already been given

or is in prospect. If such an inoculation has already been done at least four days should be allowed to elapse before a primary vaccination is attempted. If the primary vaccination is done first then inoculation against yellow fever should not be given until three weeks afterwards.

METHOD

The form of acu-puncture known as 'multiple pressure' has been officially recommended since 1948 and is now widely used. It is described in detail in a current Ministry of Health memorandum (No. 312/Med. 1948: H.M. Stationery Office, price 2d.). The essential features are shown in figures 1 and 2.

The advantages that can be claimed for this method are: (a) It is relatively trauma-free, practically painless, and therefore more acceptable than other methods to young children and their parents. (b) The special skill required, and therefore the practice needed by the vaccinator to obtain satisfactory results, is minimal.

Probably more important in vaccination than the actual method of scarifying or puncturing the skin is the strict observance of precautions against inadvertent destruction of the living virus particles in the lymph. Non-volatile antiseptics, e.g., iodine or picric acid, should not be applied at any time immediately before or after vaccination to the area of skin used. To clean the skin with surgical spirit is probably unwise and if anything is used for this purpose a more volatile substance, such as acetone, is preferable. If washed with soap and water the skin site should be carefully dried. Any needle or other instrument employed after sterilization by heat should be given time to cool. The gauze used to wipe away excess lymph should be sterile but should not contain any antiseptic. These precautions may seem elementary, but neglect of them, together with careless storage (and not poor lymph), appears to account for nearly all failures.

The skin over the posterior border of the deltoid muscle on the left arm is the site of election for vaccination and the supposed cosmetic advantage of other sites does not outweigh their possible disadvantages. In all urgent and obligatory primary vaccinations there should be at least two separate areas of needle pressure, or scarification more than an inch apart. Urgent re-vaccinations should also be done on at least two skin areas.

In doing re-vaccinations (i.e., any vaccination except the first) by the multiple pressure method, at least 30 pressures of the needle per area should generally be given. This number of 'pressures' should also be used for primary vaccination when it is urgent or obligatory. In doing routine or non-urgent primary vaccinations a smaller number of pressures, down to 10, may be preferred, but I do not consider that a smaller number of pressures will necessarily reduce the extent and severity of the subsequent local reaction.

LOCAL REACTION

The recording and interpretation of the local reaction resulting from a primary vaccination is straightforward. Inspection at about the seventh day is sufficient, because the typical vesiculo-pustular reaction of primary vaccinia does not usually begin until the fifth day, and has reached a maximum before the tenth day. This form of local reaction can be interpreted with confidence as an indication that the previously non-immune subject, having been infected with vaccinia, has acquired an immunity to smallpox

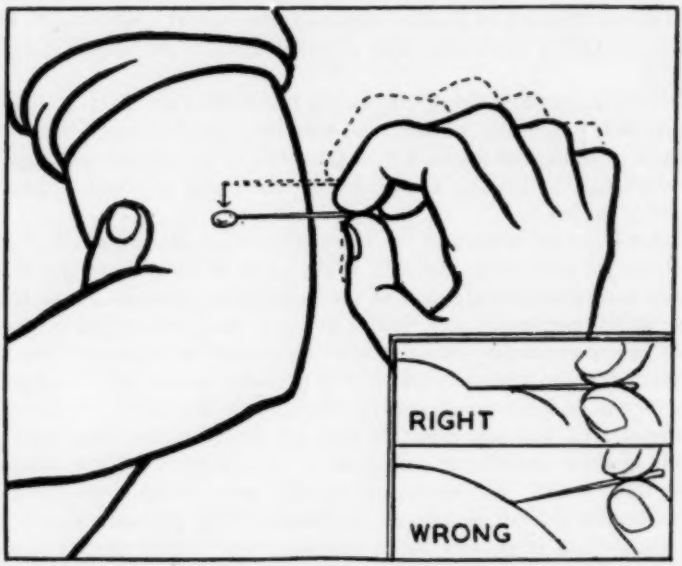


FIG. 1.—The 'multiple pressure' method of vaccination, showing the rapid up-and-down motion of the side of the needle, held by the hand at the right, against the drop of vaccine on the arm at the left.

which will be complete for at least three years, and partial for a great deal longer. On the revised form of standard record card, suggested by the Ministry of Health in September 1950 for the use of local health authorities and shown in figure 3, this result is indicated by ringing the letter A.

The recording and interpretation of the local reaction resulting from the re-vaccination of a person already primarily vaccinated is sometimes more difficult and will require inspection on at least two occasions, preferably about the third day and again on the seventh day. In re-vaccinations so inspected one or other of two types of local reaction will be encountered (i.e., in the absence of the typical purulent vesicle of primary vaccinia mentioned above). The one starting on about the third day, or a little earlier,

begins as a papule and progresses to the formation of a vesicle which has reached a maximum and has crusted *before* the seventh day. This is the so-called 'accelerated' or 'vaccinoid' reaction. It can be interpreted as the local skin response of a person who at the time of re-vaccination had partially lost the immunity to vaccinia (and therefore to smallpox) conferred by previous vaccination, but who has on re-vaccination promptly regained an immunity which will be complete for at least three years and partial for much longer.

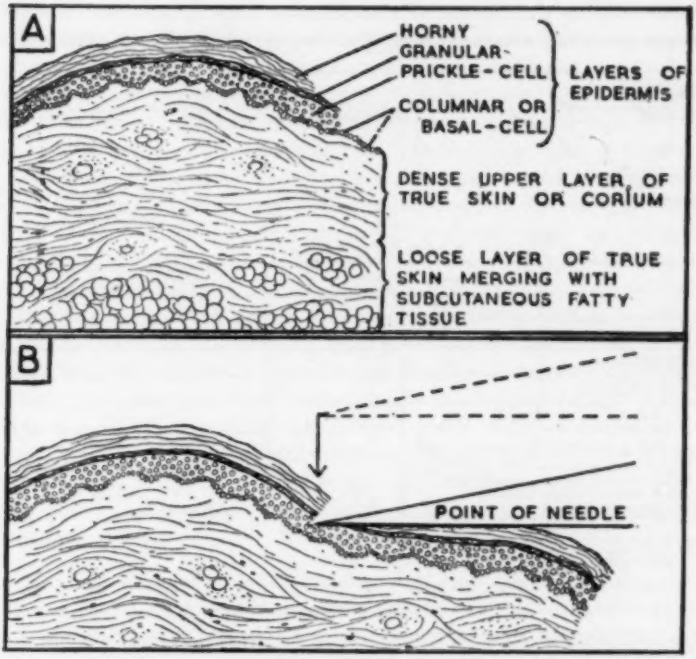
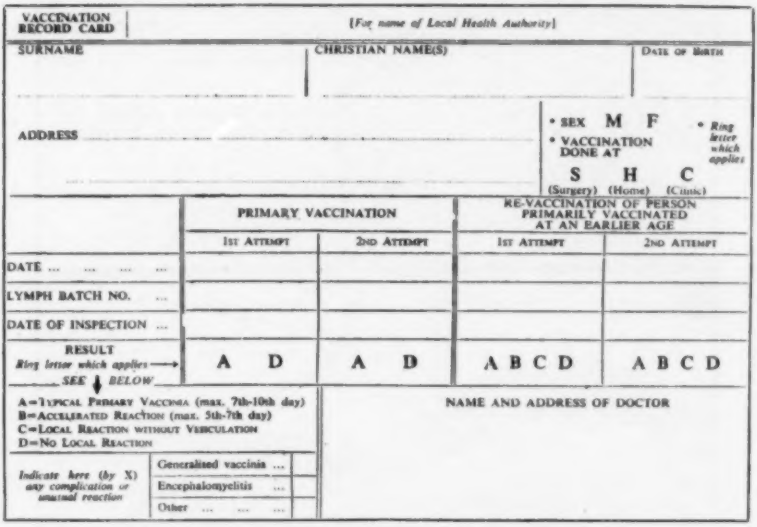


FIG. 2.—(A) Diagrammatic section of the skin of the arm. (B) Same showing the motion of the needle from its first position above and parallel to the skin (indicated by the dotted outline) to its final position pressing against the surface of the skin and entering it slightly.

This reaction is indicated on the standard record card by ringing the letter B.

The other type of local reaction which is commonly seen after re-vaccination is less definite and difficult, if not impossible, to interpret with confidence. Beginning within twenty-four hours as a small itchy papule this reaction has reached a maximum by the third day and, although it commonly develops a small head which eventually desquamates, it does not usually form a true vesicle, and only rarely one which extends in size beyond the

small area over which the needle pressure or scratch was made. After the third day this form of reaction generally disappears rapidly, but in some persons it may persist and still irritate, but without further increase in size, for a week or ten days. It is indicated on the standard record card by ringing the letter C. Although this is the type of local reaction which is usually seen after the re-vaccination of persons who have been repeatedly vaccinated, and also in those who have good reason to believe themselves immune to smallpox, it cannot be interpreted with confidence as an infallible indication of immunity to the disease. Re-vaccination with lymph heated until it contains no living vaccinia virus will often produce this reaction, or one



VACCINATION RECORD CARD — [For name of Local Health Authority]

SURNAME | CHRISTIAN NAME(S) | DATE OF BIRTH

ADDRESS

• SEX M F • Ring letter which applies

• VACCINATION DONE AT S (Surgery) H (Home) C (Clinic)

	PRIMARY VACCINATION		RE-VACCINATION OF PERSON PRIMARILY VACCINATED AT AN EARLIER AGE	
	1ST ATTEMPT	2ND ATTEMPT	1ST ATTEMPT	2ND ATTEMPT
DATE				
LYMPH BATCH NO. ...				
DATE OF INSPECTION ...				
RESULT *Ring letter which applies* → *SEE* ↓ *BELOW*	A D	A D	A B C D	A B C D

A=TYPICAL PRIMARY VACCINIA (max. 7th-10th day)
B=ACCELERATED REACTION (max. 5th-7th day)
C=LOCAL REACTION WITHOUT VESICULATION
D=NO LOCAL REACTION

NAME AND ADDRESS OF DOCTOR

Indicate here (by X) any complication or unusual reaction

Generalised vaccinia ...
Encephalomyelitis ...
Other ... ...

FIG. 3.—Vaccination record card.

indistinguishable from it clinically. It can be shown that up to about 10 per cent. of persons giving this reaction to heated lymph have in fact no adequate immunity to vaccinia and probably none to smallpox, because they will subsequently give a typical vesiculo-pustular reaction when vaccinated with unheated potent lymph. It is therefore likely that this type of reaction is allergic in nature and is the result merely of hypersensitivity to dead virus or to other possible antigens in the lymph. It is clearly not necessarily associated with immunity either to vaccinia or smallpox. When obtained at the first re-vaccination a very long time after a primary or other vaccination this reaction is an indication to make a further attempt with a different batch of lymph. The same rule of a second attempt with a different batch should be followed in any instance when this reaction is obtained with a lymph of which the potency is doubted.

No reaction, i.e. failure to 'take', in a primary vaccination done at the age of three months or later, usually means inactivation of the lymph used, either before or during the actual vaccination. In all such instances a second attempt should be made with a different lymph fresh from proper storage, and the details of the technique used should be checked for the common faults mentioned above. In very young infants repeated failure to 'take' on primary vaccination is occasionally encountered. This is probably due to the transfer from a well-vaccinated mother *via* the placenta of humoral antibodies to vaccinia. In such infants a further attempt when the child is a few months older usually produces the typical reaction of primary vaccinia, but until that is obtained immunity to smallpox cannot be assumed. Adults who are complete non-reactors to primary vaccination or re-vaccination are rarely encountered, and the only safe assumption to make about such persons is that they are not immune to smallpox. The causes of what is apparently an inherited or acquired resistance to infection with vaccinia *via* the skin are not known, but instances have been reported in which primary vaccination was not achieved even with special precautions over lymph and technique until the fifth or sixth attempt. It seems clear that a doctor called upon to vaccinate a person likely to be exposed to smallpox should not regard failure to take on only two occasions as evidence of immunity, but should persist with further attempts. Moreover, if there is no scar as evidence of a previous local reaction of the primary vaccinia type he should warn the subject that until such a reaction is obtained, susceptibility to smallpox must be assumed. No reaction or failure to 'take' is indicated on the standard record card by ringing the letter D. The standard card only provides space for the recording of two attempts, but this does not mean that two attempts are officially regarded as being in practice the limit of the efforts to be made to vaccinate a refractory subject.

LABORATORY TESTS FOR IMMUNITY

Satisfactory laboratory methods for the titration of humoral antibodies to variola and vaccinia antigens have recently been devised, but at present they are only available on an experimental scale. These tests can be used to investigate the significance of the frequently encountered precocious and mainly non-vesicular type of local reaction to vaccination (indicated for record by ringing C), and also of the rare instances of repeated failure to show local reaction. Their clinical application as a routine in cases in which the immunological result of repeated vaccination is in doubt is a likely development in the near future.

COMPLICATIONS OF VACCINATION

In a primary infection with vaccinia the virus present in the blood stream at or just before the time when the local reaction reaches a maximum causes a certain amount of general disturbance. At this time headache with a little fever and malaise is usual, but this constitutional upset is generally transient.

The severe form of generalized vaccinia which is only associated with the vaccination of persons having chronic eczema has already been mentioned. In a very small proportion of non-eczematous persons (probably about 1 in 20,000) the slight but transient constitutional disturbance usual in primary vaccinia is accompanied by a generalized papulo-vesicular eruption. The lesions of this eruption are usually few and widely scattered. They resolve rapidly and completely without special treatment.

The *central nervous system* complications of vaccination included in the term 'post-vaccinal encephalomyelitis' are very rare even when primary vaccination is done at the unfavourable school or young adult ages. Pathologically this condition is grouped with the similar encephalitides of unknown etiology that are associated with other virus infections, e.g. measles, mumps, and chickenpox. Cases of all the conditions in this group were made compulsorily notifiable by regulations which came into force at the beginning of 1950. When associated with vaccinia this condition usually develops between the eleventh and fourteenth days after vaccination. Clinically it begins with headache, fever, and severe prostration, sometimes progressing rapidly into coma, either with or without convulsions. It may be fatal within a few days. Milder cases, which are fortunately a majority, have mainly meningeal symptoms, and rapidly recover without any evidence of permanent damage to the central nervous system. In others, when the course is more prolonged, there is permanent damage to the spinal cord with paralytic sequelæ. The threatened or actual development of any of these notifiable complications of vaccination is usually an indication for removal to hospital and for consultation with a specialist physician or neurologist.

Thrombosis of the cerebral or coronary blood vessels has occasionally been reported as a complication of primary vaccination done in elderly persons, or of a first re-vaccination done late in life after primary vaccination in infancy. For this reason only urgent or obligatory vaccination should ordinarily be considered in persons over seventy years of age.

Keloid scar formation is an occasional late result of primary vaccination. This appears to depend upon individual idiosyncrasy of the vaccinated subject and not to be connected with a specific secondary infection of the primary vaccinia pustule. Penicillin tulle applied to the fully developed vaccinia vesicle at about the seventh day (but not before) has been advocated as a method of controlling excerbation of the local reaction to vaccination by secondary infection. In subjects prone to develop skin sensitivity to penicillin such a dressing may do more harm than good, so that its use as a routine does not seem advisable. Applications of X-rays will usually diminish the unsightliness of a keloid vaccination scar.

A primary vaccination does not need a dressing before the development of the local reaction at about the fifth or sixth day. After that, in infants a simple loose dressing of sterile lint or gauze, which will prevent contact with the clothing, is all that is required. For adults, special forms of non-occlusive

dressing are sold which protect the crust on the pustule from being knocked or torn off, and allow free access of air so that the lesion does not become moist or macerated and rapidly heals. Occlusive forms of dressing should not be used.

THE FUTURE

We still know comparatively little about the microbiology of Jennerian vaccination which, with only one major variation in material or method, namely, the introduction of glycerinated calf lymph at the end of the last century, has now been practised all over the world for 150 years. This is probably because the micro-organisms of a virus disease like vaccina, being obligatory intra-cellular parasites, are difficult to cultivate artificially, and in consequence are not readily prepared in a form suitable for the physical and chemical manipulation necessary to facilitate their investigation. As regards the group of animal pox viruses to which vaccinia belongs, and which also includes the micro-organisms of smallpox and cowpox, methods of culture in the developing hen's egg are now available. This, and the recent discovery that members of the group have in common the property of hæmagglutination, may soon help to remove some of the imperfections as well as the uncertainties at present associated with the practice of vaccination.

Unfortunately the assessment of human immunity to any infectious disease is much more than a matter of measuring humoral antibodies to artificially prepared antigens, and no new method of immunization against smallpox could be tested properly without deliberate exposure of the supposedly protected to the naturally occurring disease, i.e., without voluntary or deliberate risk of human life. This is now the chief difficulty to be faced in the development of new and better prophylactic agents against smallpox.

All successful forms of prophylactic inoculation, and not only those, such as vaccination, which utilize living micro-organisms of attenuated virulence, are occasionally dangerous. Most of the rare instances of untoward reaction appear to depend upon the reacting individual rather than the reagent. It is possible therefore that the key to a solution to the problem of so-called 'accidents of immunization' will be the discovery of simple methods for the detection of the relatively few individuals who, either temporarily or permanently, have become abnormally sensitive to useful prophylactic agents which are relatively innocuous to the majority. Immunization of these hypersensitive individuals ought to be both practicable and trouble-free when done under the cover of antigen-antibody reaction-suppressing substances like the drugs of the antihistamine group or the recently discovered corticotrophic hormone of the anterior pituitary gland (ACTH) and the adrenal hormone cortisone.

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DIPHTHERIA IMMUNIZATION

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PROTECTION of large numbers of children against diphtheria has been one of the most successful enterprises of preventive medicine in this and other countries. Memories are short, and it is not easy for the young doctor entering practice in 1951 to realize that so recently as 1941 slightly more than one-tenth of all the deaths of children aged one to fourteen years were due to diphtheria. In 1941 there were 2,315 deaths from diphtheria in this age-group, and in 1949, the last year for which deaths by ages are available, there were 67. In 1950 there were only 49 deaths from diphtheria at all ages, so that the number in children must have fallen still further. In 1941 there were 50,797 'original' notifications at all ages, and in 1950 there were 2,833, of which only 980 were subsequently confirmed. This reduction of incidence and mortality is a great achievement, but there are potential dangers in the present situation which should be generally recognized. Now that diphtheria is an uncommon disease it is not so easy as it was to persuade parents to have their children protected against it, nor is it easy for the general practitioner of today to think of diphtheria as a possible diagnosis when he sees a child with a sore throat in the way that his predecessor did only ten years ago. The new attitude of mind of the parent carries with it the danger that a poorly protected child population may grow up, and that of the doctor the danger that cases may be missed in the early stages of an epidemic and may not receive early treatment. There is no evidence that diphtheria, if it does occur, is any less deadly than it used to be. There can be no reasonable doubt that the great extension of immunization which has occurred since the opening of the national campaign in 1941 has been the major factor in reducing morbidity and mortality. It will be a tragedy if a false sense of security leads to any falling off in numbers of children protected.

PROPHYLACTICS

The number of different prophylactics on the market is considerable and some of the names or initials by which they are known are difficult to understand. It may therefore be desirable to say a little about the general principles underlying their preparation. All, of course, depend upon the fact that *C. diphtheriæ* produces an exotoxin which stimulates the production of antibody when it is injected. The first substance used for active immunization was a mixture of active toxin neutralized by an appropriate amount of antitoxin (von Behring, 1913). This worked quite well but had the disadvantage that, under certain conditions of storage, the neutralization of the toxin by the antitoxin was rendered ineffective, with unpleasant or even disastrous results for the patient. In 1923, Ramon prepared anatoxine or

toxoid by treating toxin with formalin and heat. This renders the toxin harmless without destroying its power to stimulate the production of antibody. In this country this substance is usually known as toxoid, but synonyms in use elsewhere are: anatoxine, formol-toxoid, soluble toxoid. Toxoid by itself is still used extensively as a prophylactic in other countries, but here it is more usual to use one of the substances derived from it.

Alum precipitated toxoid (*A.P.T.*).—This is derived from toxoid by the addition of alum with subsequent washing of the precipitate. It is absorbed relatively slowly. It is the substance which has been most extensively used in the national immunization scheme. It will nearly always produce a satisfactory immunity if given in two doses with a month's interval between them. In children it is reasonably free from unpleasant reactions, but is liable to produce them in adults.

Toxoid-antitoxin floccules (*T.A.F.*).—This is a suspension of the floccules formed when toxoid and antitoxin are mixed in suitable proportions. It is a weaker antigen than A.P.T. but is less liable to produce reactions, and for that reason it is often used for immunizing adults or those who are peculiarly sensitive. It is usually given in three doses which are larger than those recommended for A.P.T.

Purified toxoid, aluminium precipitated (*P.T.A.P.*).—This prophylactic was introduced by Holt (1947). Bousfield (1947), as a result of field trials, considers that it is less liable to cause local reactions than A.P.T. and, when injected in a single dose, that it gives a consistently higher Schick conversion rate. This relatively new prophylactic is at present being tried on a large scale by the Medical Research Council.

METHODS OF USE OF PROPHYLACTICS

What has been said so far has been non-controversial, but when we come to consider the details of immunization we find that there is disagreement among experts on many points. It would be impossible, in a reasonable compass, to do justice to all the arguments for and against very early immunization and for and against individual prophylactics (arguments in favour of early immunization are advanced in a series of papers by Barr and Glenny (1949, 1950a,b, 1951), and by Bousfield (1951)). I shall content myself with a statement of what seems to me to be a reasonable line of procedure for an individual child or adult, fully recognizing that much the same result can be achieved in other ways.

The suggested procedure is to give a dose of 0.5 ml. A.P.T. at about the age of eight months, followed by a second dose at least one month later. At about the age of three a small reinforcing dose of A.P.T., 0.2 to 0.3 ml., may be given. When the child is about to attend school for the first time it is advisable to make sure that he is protected by doing a Schick test. In the unlikely event of its being positive a further small dose of A.P.T. may be given. When a satisfactory basal immunity has been established at an early

age there is usually a considerable production of antitoxin as a result of quite small reinforcing doses, and even the small amount of toxin used in the Schick test will often be an adequate stimulus.

Adults.—Primary immunization of adults is unsatisfactory, both because it is less effective than is that of children and because unpleasant local reactions are more likely to occur. Generally speaking it is best reserved for nurses, and others who like them are exposed to special risks of contact with cases of the disease. A preliminary Schick test should always be done, and this serves as a useful but not infallible guide to subsequent procedure. The Schick-negative subjects do not need any further treatment. Unpleasant local reactions are most likely to occur in those who show a reaction to the control injection of the Schick test and a rather greater reaction to the test fluid, i.e., those who have a pseudo-reaction plus a true positive. It is wise to proceed very cautiously in these cases. Three doses of T.A.F. are less liable to cause reactions than is A.P.T., and the interval between the first two doses should be at least one month, although that between the second and third need not be more than two weeks. If A.P.T. is to be used for adults it is best to start with a dose of 0.2 ml. and, if this is well tolerated, to follow it after a month with a dose of 0.5 ml. If it is not well tolerated, immunization may be completed by two doses of 1 ml. T.A.F. (Vollum and Wilson, 1947).

It may be that P.A.P.T. will prove to be a more satisfactory antigen than either A.P.T. or T.A.F., but as the results of really extensive trials are not yet available the well-tried antigens, which have proved very satisfactory on the whole, have been recommended.

Combined antigens.—As this article is concerned with diphtheria only, nothing has so far been said about combined antigens, but it should perhaps be mentioned that combined antigens against pertussis, tetanus and diphtheria, or against pertussis and diphtheria, have been used extensively, particularly in the United States. There is no evidence that the fact of combination interferes with their effectiveness, but at the present time my preference is for diphtheria antigens by themselves.

COMPLICATIONS OF PROPHYLACTIC INOCULATION

Local reactions and the ways of avoiding them have already been discussed. They are not serious but can be unpleasant. It is very doubtful if severe or fatal anaphylactic reactions of the kind which very rarely follow injections of serum ever occur after injections of diphtheria prophylactic. Theoretically they would be more likely to follow T.A.F., which contains a little serum, than A.P.T. It is, however, wise to proceed with immunization cautiously in asthmatics and others who have symptoms of excessive sensitiveness. There is one association of inoculation recently described by McCloskey (1950) in Australia, and by Geffen (1950), Martin (1950), and by Bradford Hill and Knowelden (1950) in this country, which must be mentioned.

This is the association of poliomyelitis and prophylactic inoculation. The subject is most difficult to discuss because so little is known about it for certain, except that occasionally, but too often to be explained by chance, prophylactic inoculations have been followed by poliomyelitis, usually affecting chiefly the limb into which the injection was given. Even that vague statement of the present state of our knowledge is open to objection, in that there is some doubt whether the effect may be due to the slight trauma of the inoculation and may have nothing to do with the prophylactic. There has been much speculation about this association, and possible ways of avoiding the risk have been suggested (Bousfield, 1951). It must be admitted that all these are at present based largely on speculation. Until more is known it seems to me that the reasonable thing to do is to avoid giving prophylactic inoculations at times and in places where poliomyelitis is prevalent. This cannot be an absolute safeguard, because occasional cases of poliomyelitis occur in unexpected places at unexpected times, but it should thus be possible to reduce the risk to one so small that it should be taken. There are, after all, few effective means of treatment or of prophylaxis which are utterly devoid of any risk to the patient, and even many purely diagnostic procedures have some risk.

SUMMARY

The ideal at which to aim is that all children should receive a course of immunization before their first birthday, which will give them a good basal immunity. Once this is achieved it can be maintained by small doses of prophylactic given at long intervals. Even if the immunity is not subsequently reinforced, a substantial benefit has been conferred on the child, because his immunity response to infection is always likely to be much more rapid and much larger than that of an individual who has never had any basal immunity.

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WHOOPING-COUGH IMMUNIZATION

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WHOOPING-COUGH is at present responsible for more deaths than any of the other common infectious diseases of childhood. It is also one of the most prevalent. Sixty to seventy per cent. of children suffer from clinically recognized attacks before they reach school-leaving age. Measles is the only other of the diseases in this group with a comparable incidence—80 to 90 per cent. of school leavers have a history of having suffered from the disease. In contrast, only 12 per cent. of school leavers had a history of diphtheria, even before immunization was common. But, although the incidence of diphtheria was relatively low, the case fatality rate was high.

In the past ten years, 9,401 deaths occurred from whooping-cough in England and Wales. Death rarely occurs in children over four years of age, and more than half of all the deaths are in children under one year. The actual number of cases in babies up to six months is small, but the proportion which are fatal is high. In 60 per cent. of cases in children between one and three years of age the cough lasts for eight or more weeks, and in 36 per cent. the cough lasts for more than ten weeks. Although exact estimates of permanent lung damage are difficult to obtain, there is good evidence that atelectasis is common, and bronchiectasis is not infrequent. During the course of the illness broncho-pneumonia often supervenes, and convulsions, although less often met with than in the past, are still observed in many hospital patients. There is evidence that the convulsions in a small number of cases may be the precursors of hemiplegia or of mental deficiency, epilepsy, or even amentia.

DIAGNOSIS

Clinical diagnosis depends upon hearing the characteristic paroxysmal cough. The whoop does not occur in every case and, especially in young children, whooping may be absent throughout the course of the illness. Vomiting is a more constant sign, and at some stage nearly all children vomit at the end of the paroxysms. When the disease is epidemic, clinical diagnosis of established cases presents few problems in children over six months of age.

Conclusive laboratory diagnosis depends upon the isolation of the causal organism. The whooping-cough bacillus—*Hæmophilus pertussis*—was first identified by Bordet and Gengou (1906), who isolated it in culture from specimens from children with the disease. In appearance it closely resembles *Hæmophilus influenzæ*, but requires a complex potato-glycerin-blood medium for primary isolation. On the culture plate the colonies have a

smooth, dome-shaped, glistening, pearl-like appearance. Growth is slow, and incubation for forty-eight to seventy-two hours or even longer is necessary. Three methods of obtaining specimens for culture are in use: the cough plate, the postnasal swab, and the pernasal swab.

In domiciliary practice *the pernasal swab* is most satisfactory. It is made from 7 inches of 'nichrome' wire S.W.G. 25 (0.51 mm. in diameter) and has a fine wisp of cotton-wool wound firmly round the tip. The swab is inserted into either nostril and passed backwards parallel with the roof of the mouth until it reaches the postnasal space. It is then withdrawn, placed in a sterile tube, and taken or sent to the laboratory on the same day.

Positive swabs should be obtained from 70 to 80 per cent. of cases in the first two weeks of illness. There is some evidence that swabs are most likely to be positive if taken at the end of the first week of symptoms, just before the paroxysmal cough develops. Recently, Lacey (1951) has devised a selective medium for the growth of *H. pertussis*. Bacteriological diagnosis should be greatly facilitated by this medium, which inhibits the growth of nearly all other bacteria commonly found in the nasopharynx.

Bacteriological confirmation of diagnosis should be attempted in all early cases of the disease. Whooping-cough is highly infectious, especially for children exposed to infection in their own homes; in susceptible children under three years of age living in the same house as a case the attack rate is 80 to 90 per cent. In day nurseries and other places where exposure to the infection may be less intense, the risk of attack is not so high and early diagnosis and isolation of cases might prevent the spread. There is a further reason for conclusive diagnosis in the pre-paroxysmal stage; if chloramphenicol, aureomycin or terramycin is found to modify the disease, it is unlikely that they will be effective in cases in which the disease has lasted for more than a few days or a week. No certain evidence of the value of the new antibiotics has yet been obtained and there is at present no justification for their use in *uncomplicated* cases.

ACTIVE IMMUNIZATION

Strains of *H. pertussis* isolated from different cases and in different epidemics show no significant variation in their antigenic structure. There was therefore good reason for attempting to protect susceptible persons by vaccination with killed cultures of the organism, and soon after the identification of the etiological agent reports were made of the use of vaccines, both in prevention and treatment.

These vaccines were prepared from stock cultures which had been repeatedly subcultured, and results were disappointing, except for those of Zachariasen (see Madsen, 1933), who used vaccines made from freshly isolated strains in two epidemics in the Faroe Islands in 1923 and 1929. Epidemics of whooping-cough are infrequent in the Faroes and, when they do occur, the infection spreads rapidly and extensively. In the 1923 outbreak vaccination was begun during the epidemic and was thought to have reduced the severity of the disease without reducing the incidence. In the second epidemic vaccination preceded the outbreak and was said to have lessened the incidence, severity and mortality in the vaccinated. Leslie and

Gardner (1931) observed that the antigenic structure could be altered when *H. pertussis* was cultured over a period in the laboratory, and described four phases of the organism, the antigenic properties of which differed. Sauer (1937) prepared vaccines from freshly isolated strains in Phase I, and reported that his vaccines gave good protection, and that of 128 children exposed to infection, 94 of them in their own homes, only 6 developed the disease. Many reports of successful vaccination of children followed, notably those of Kendrick (1939). Most of them were from workers in the United States of America and Canada. But Doull *et al.* (1939) in North America, and McFarlan *et al.* (1945) in this country, found that vaccines apparently prepared by similar methods to those of Sauer and Kendrick gave no protection. Felton and Willard (1944) and Tudor Lewis (1946) should be consulted for detailed reviews of the investigations made up to this period.

The favourable reports of vaccination were criticized mainly on the grounds that the experience of vaccinated children was being compared with that of unvaccinated children who were not similar in all relevant respects. Bell (1941, 1948) made two well-controlled trials, one with alum-precipitated pertussis vaccine alone, and one with alum-precipitated pertussis vaccine plus diphtheria toxoid. In each trial there were three to four times as many cases in the vaccinated as in the unvaccinated children. His work showed conclusively that pertussis vaccination was of value for prevention.

Since 1944, a Committee of the Medical Research Council and the Medical Officers of Health of Oxford, Manchester, Leeds, Cardiff, Tottenham, Edmonton, Wembley, West Ham, Poole, Leyton and Walthamstow have been engaged in an intensive field and laboratory investigation with different vaccines. These trials are of interest for a number of reasons.

In the early trials, a report of which has been published (M.R.C. Rep., 1951), half the children were inoculated with the pertussis vaccines being tested, and half were inoculated with a so-called 'anti-catarrhal' vaccine which contained no *H. pertussis*. The children were placed at random in the vaccinated or unvaccinated groups and, although both the field workers and the mothers knew this was being done, none of them knew to which group a particular child belonged. It was gratifying to find that nearly 10,000 mothers agreed to take part in an investigation of this kind. After inoculation each child was visited monthly for two years by a special nurse investigator, and during this period information was collected on the exposure of the children to pertussis, and on the number of cases which occurred. So far as possible a bacteriological diagnosis was made. Ninety-six per cent. of the children were swabbed and a positive swab was obtained from 60 per cent.

In the vaccinated group, 3,801 children, and in the unvaccinated group, 3,755 children, were given the complete course of three inoculations at monthly intervals. By the end of the inquiry, 149 cases had been diagnosed in the vaccinated group and 687 in the unvaccinated group. Of the cases in the vaccinated group 73 per cent. were classified as mild compared with 24 per cent. in the unvaccinated group. The incidence of the disease in the vaccinated therefore was 78 per cent. less than in the unvaccinated children. The cases which did occur in the vaccinated were milder and lasted a shorter time than those in the unvaccinated group. There was no evidence of waning immunity two years after vaccination.

These results were obtained with three vaccines, Glaxo, Sauer (Parke, Davis and Co., Detroit) and Michigan. The vaccines showed considerable variation in potency and, although all three gave protection, the Michigan vaccine was considerably more effective than the other two. The reason for these variations is not known. Vaccines have been prepared, for use in the Medical Research Council investigations, by the Michigan method, and

they are being compared in field and laboratory studies with vaccine sent from Michigan. The result of these investigations will not be known for eighteen months or two years. In any event it is undesirable that vaccine preparation should be confined strictly to one method. Better methods than those of the Michigan workers may be found. The only satisfactory way to ensure the production of vaccines of uniformly high potency is to submit them before issue to a standard laboratory test which has been proved to give in the laboratory a true indication of their immunizing power in children. Parallel laboratory and field studies designed to answer this question have now been in progress for two years, and if a satisfactory test is devised it seems reasonable to assume that whooping-cough vaccination will be employed on a similar scale to diphtheria immunization. In the meantime there is insufficient justification for a country-wide campaign. For the individual child or group of children, however, the procedure may be worth while.

COMPLICATIONS OF INOCULATION

No inoculation procedure is without risk, and possible untoward reactions should be borne in mind when using a vaccine of unknown potency.

Anderson and Morris (1950) reported in this country the case of a child who had recently recovered from mumps encephalitis and who developed symptoms of convulsions with hemiplegia after inoculation with combined pertussis-diphtheria antigen. Cases of encephalopathy, with sometimes paralysis or other permanent sequelæ, had previously been noted in the United States of America by Byers and Mole (1948) and Toomey (1949).

Such complications are extremely rare. They are twice as common in children suffering from the disease. Of the 3,801 vaccinated children investigated in the Medical Research Council inquiry, none had convulsions after inoculation. *Encephalopathy* is a risk which is associated with other bacterial antigens and, until more is known of its etiology, it would be wise not to inoculate with pertussis vaccine any child who has a personal or family history of convulsions, hydrocephalus, epilepsy or other cerebral lesions. It probably is also unwise to inoculate a child who is in the immediate convalescent stage of the common specific virus infections of childhood, or who is thought to be susceptible and is known to have been exposed to such an infection within three to four weeks before the date of the proposed inoculation. In addition to the risk of encephalopathy, pertussis inoculation may be associated with the occurrence of *poliomyelitis in the inoculated limb* (see Gale, page 231), and in the present state of our knowledge inoculations should be postponed when the incidence of poliomyelitis in an area is high. Little at present is known of the factors which are responsible for the occasional occurrence of poliomyelitis at the site of inoculation. The risk appears to be confined to a period of four weeks after the inoculation. If there is any truth in the speculation that the degree of local trauma is important, it would be reasonable to use antigens which do not contain alum. Plain suspensions of killed organisms may have advantages over alum-precipitated vaccines which cause more local reactions, and, although

there is evidence that combination of diphtheria and pertussis antigens does not interfere with the protective properties of either, it is probably wise not to combine the antigens until such time as a satisfactory method of doing so without the use of alum is worked out on a commercial scale.

CONCLUSION

In whooping-cough vaccination at the present time the following provisional recommendations are proposed:—

(1) Vaccination should not be employed on a country-wide basis until the potency of vaccines can be reliably assessed by means of a laboratory test.

(2) Plain suspensions of killed bacilli should be employed in preference to alum-precipitated vaccines or to combined diphtheria-pertussis antigens which contain alum.

(3) Vaccination should not be carried out when the incidence of poliomyelitis is high in an area.

(4) Children with a personal or family history of organic nervous disease should not be inoculated.

(5) Children should not be inoculated if they are known to be convalescent from any of the common fevers, particularly those due to virus infections.

(6) Children should not be inoculated during the incubation period of any of the common fevers if they are known to have been exposed and if they are thought to be susceptible.

(7) Vaccination should not be attempted before the age of six months and should be carried out *after* diphtheria immunization, which is the more important.

(8) If the reaction to the first inoculation is severe, or if the child develops convulsions at any time during the inoculation period, no further inoculations should be given.

(9) The dosage should be that recommended by the manufacturer of the vaccine. In general, three doses, each of 0.5 ml., or 1 ml., depending upon the concentration of bacteria in the vaccine, are given at monthly intervals.

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MEASLES IMMUNIZATION

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CURRENT views on the prophylaxis of measles are that active immunization is still in the experimental stage, passive immunization is efficient but is not without its dangers, and chemoprophylaxis prevents certain serious complications of the disease but has a limited application.

ACTIVE IMMUNIZATION

A vaccine consisting of attenuated virus has been administered experimentally as an atomized mist, in nasal drops and by intradermal injection. Although promising, the method is not yet practicable.

PASSIVE IMMUNIZATION

Passive immunization provides immediate, but short-lived, protection against a disease by the introduction of specific antibodies derived from some immune animal or human being. The product used is usually the serum. Immune sera against such bacterial diseases as diphtheria and tetanus are readily obtained from animals (usually the horse), but most antiviral sera need to be obtained from human sources. This is so in measles. The emergence of an efficient and safe seroprophylactic—gamma globulin—has been one of the most striking advances in laboratory practice in recent years. The necessary knowledge for its production became available as the result of modern advances in the knowledge of blood and its derivatives.

A week or so after an attack of measles, antibodies appear in the blood and persist in diminishing amounts for years. As most adults have had measles, the blood of adults as well as of convalescents provides a source of measles antibodies. Such antibodies are closely related to the normal globulins of the body; indeed Haurowitz (1947) regards them as globulins modified by the presence of the antigen—the virus. When released from the liver and bone marrow into the circulation these altered globulins constitute the specific humoral antibodies. The blood, and any preparation of it retaining these globulins, passively protect against measles. The products which have been used are whole blood, convalescent serum, adult immune serum, plasma, placental extracts and gamma globulin.

DANGERS OF PROPHYLAXIS

Because these products are of human origin they are incapable of causing the allergic and anaphylactic reactions which occasionally follow the administration of horse serum. When measles prophylactics first appeared they were regarded as so safe that there appeared to be no serious contraindication to their use. Unfortunately, this is not true. There are definite dangers, uncommon but of two types. The first is the possibility of intro-

ducing infective agents, particularly the virus of homologous serum jaundice; the second, applicable only when whole blood is given, concerns the possible development of sensitivity to red blood cells (rhesus factor).

Homologous serum jaundice follows the parenteral injection of human blood products such as serum, plasma or blood itself. The risk is greater when the blood of several donors has been pooled to provide a product of satisfactory potency, as in convalescent or adult immune sera. After a long incubation period (60 to 120 days) jaundice appears, similar in clinical character to catarrhal jaundice, but with a definite fatality rate in children (Ministry of Health, 1943). The virus is not destroyed by the degree of heat to which serum can be brought without inactivating it, nor by the concentration of disinfectants commonly used to sterilize blood products. Success is claimed, however, for irradiation of the serum by germicidal ultra-violet light, and all sera now issued from official sources are so irradiated.

The rhesus factor.—Red blood cells must not be administered to anyone, particularly to girls and women of child-bearing age, unless consideration has been given to their rhesus compatibility with the injected blood. If this is not done there is a danger of sensitizing certain recipients to the rhesus antigen of red blood cells. Such a state will not be apparent at the time but may cause serious manifestations later, of two types:—

(1) If a blood transfusion ever becomes necessary there is danger of a transfusion reaction.

(2) In a pregnant woman the unborn child may be so affected that it dies or, if it survives, may be affected with one of the forms of hæmolytic disease of the newborn.

PROPHYLACTICS AVAILABLE

Whole blood.—The supply of measles prophylactics has always been difficult. Parental whole blood was usually readily available. Although the dose required was large (10 to 15 ml.) and needed to be divided for intramuscular injection into a child, parental whole blood was a convenient emergency measure until knowledge of rhesus incompatibility ruled it out.

Convalescent measles serum.—Blood from convalescents is collected about fourteen days after the onset of an attack. Before pooling, each sample is tested for syphilis and is subjected to such laboratory procedures as are deemed proper to reduce the risk of homologous serum jaundice, e.g., the addition of disinfectants, keeping the serum a month before use, and irradiating by ultra-violet light. Convalescent serum is rich in antibodies and has been particularly useful in the past in preventing the disease; it is not available in Great Britain from either commercial or official sources.

Adult immune serum.—The most suitable donors are young adults who have had measles not more than ten years previously, but any blood can be used. The average donor will provide 250 to 300 ml. of blood, and about half of this volume of immune serum is recovered. The pooled serum now available from official sources is irradiated and is regarded as safe.

Plasma.—Plasma has not been so widely used in measles prophylaxis, but in its dried form it has been found of value in the tropics. Plasma, serum and gamma globulin for passive prophylaxis can be vacuum dried. The powder thus formed keeps well, retains its potency, and when reconstituted gives results as good as fresh material. It can, moreover, be concentrated by reconstituting it in a smaller volume than it originally occupied.

Placental extract.—An extract of human placenta contains antibodies derived from the mother's blood. The chief advantage of this product was that it was in abundant supply. It sometimes gave rise to severe rashes and has been displaced by gamma globulin.

Gamma globulin.—By modern methods of electrophoresis Cohn separated the globulins of the blood into three fractions—alpha, beta and gamma. Of these the most important immunologically is gamma. In the form in which it is now available it represents a 25-fold concentration of the original plasma. The great advantages of gamma globulin are that the supply is good because it can be obtained from ordinary blood, that the dose for injection is small, and that it is free from the danger of causing homologous serum jaundice. The last statement is not strictly true, for Cockburn *et al.* (1951) reported a mild case among 56 patients given gamma globulin prepared from an icterogenic pool of plasma. The plasma itself was much more lethal: of 10 cases injected, 7 developed severe jaundice, of whom three died.

PREVENTION OR ATTENUATION

Dosage.—Measles serum or gamma globulin should be given only to those who have been exposed to the disease and only in the circumstances discussed on page 240. The passive immunity conferred lasts for two or three weeks only and can be used in two ways: either to protect completely against the disease—*sero-prophylaxis;* or to protect partially, so that the contact contracts the disease in a modified form—*sero-attenuation.* The advantage of the latter is that a modified attack is followed by a lasting immunity, whereas complete protection leaves the subject liable to a later attack the severity of which cannot be controlled as it can in known contacts. In practice, attenuation is secured by giving only half the dose of the prophylactic needed for protection, or by deferring its administration in full dose until late in the incubation period, i.e. six days or more after the initial exposure.

Gamma globulin and measles sera are given intramuscularly into the vastus externus. For the first six days after the initial exposure the doses required for children under five years of age are:—

Product	For prevention	For attenuation
Gamma globulin	1.5–2.0 ml.	0.5–1 ml.
Adult immune serum	10 ml.	5 ml.
Convalescent serum	5 ml.	2.5 ml.

For children of five to twelve years of age these doses should be doubled.

INDICATIONS FOR PASSIVE PROPHYLAXIS

Before deciding to inject contacts with passive prophylactics some recent trends in the morbidity and mortality of measles must be considered. Measles is regarded as an inevitable disease: Smith (1947) obtained a history of an attack in 96 per cent. of public-school leavers. But the disease is now much milder than it was: the death rate is only one-twelfth of what it was in the late 19th century. The case-fatality rate, i.e., the number of deaths per 1000 notifications, is now less than one. The factors which have contributed to this satisfactory state are complex. The immunity of the herd has probably increased, for measles introduced into the virgin soil of a remote island is still a fatal disease. Whether the virus has become modified in any way is uncertain. Social factors, which are known to influence the mortality but not the morbidity of the disease, have altered. It is known, for example, that measles exacts a higher death rate in the lower social classes than in the upper. The factors which contributed to this were poorer nutrition and housing; larger families in overcrowded houses, with consequent opportunity for the disease to be conveyed to the younger members of the family, in whom it was more severe and in whom complications were more fatal; poorer maternal, medical and nursing care; and no specific remedies for the fatal complications. Social legislation and new drugs have alleviated these factors. It follows, then, that measles is now a mild disease which almost everybody gets and which produces least disturbance if it can be deferred to, say, the age of five years. At this age there is little point in trying to prevent the disease, especially if it occurs in the summer; indeed, there are physicians who support the old recommendation of measles tea parties at which children can contract the disease and get it over without disrupting their later school life. Although there is no convincing evidence that measles in pregnant women is capable of causing congenital abnormalities of the type which occur with rubella, it has been suggested that an attenuated attack might result in a living defective child instead of the usual abortion.

Measles immunization should therefore be reserved for those who are subject to special risks. They include weakly and sick children, especially if under two years of age, and children in institutions or hospitals where quarantine might disrupt the work of the institution or hospital. If it is ever necessary to administer serum to a healthy child, an attempt should be made to induce an attenuated attack. If a child nevertheless develops an unmodified attack, the indications for chemoprophylaxis of the complications are those mentioned for the prevention of the disease. The routine administration of chemoprophylactics to children with measles is not recommended.

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TYPHOID IMMUNIZATION

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PREVENTIVE inoculation against typhoid fever in man was introduced by Wright and Semple in 1897. This important procedure introduced so many years ago is being used universally on an ever increasing scale. The rationale of this method of immunization is founded on definite scientific evidence, and its efficacy has been demonstrated by experience obtained in many parts of the world. Although it is possible that in the future there may be some modification in detail, there is little doubt that the value of the procedure has been confirmed and its use firmly established.

EXPERIMENTAL DATA

Bacterium typhosum was originally believed to possess two antigenic components, the H or flagellar antigen and the O or somatic antigen, but some years ago, another, the Vi antigen, was discovered (Felix and Pitt, 1934, 1935). Many strains recently isolated from cases of typhoid fever were found to possess an additional somatic antigen—the Vi antigen of Felix. This antigen is thought to be situated on the surface and is associated with virulence. In the Vi state the organism is relatively inagglutinable by an O antiserum. By heating at 100° C., or by repeated subculture, the Vi antigen is lost and the organism can then be agglutinated by an O antiserum. With this change there is a loss of virulence.

Animals inoculated with live virulent strains of *Bact. typhosum* produce antibodies to both the Vi and O antigens. By absorbing the H and O agglutinins by strains containing the H and O antigens only, a Vi agglutinating serum can be obtained. The Vi antigen apparently inhibits the reaction between the O antigen and the O antibody.

It has been shown by experiments in mice that pure Vi and pure O antisera afford specific protection against infection with Vi and O strains of *Bact. typhosum*. The Vi antibody alone is capable of protecting against infection with highly virulent strains. The O antibody neutralizes the effect of the endotoxins of *Bact. typhosum* (Felix and Pitt, 1934, 1935). Evidence of cross-protection in some degree has also been found. Therefore, theoretically, it would appear desirable for the purposes of immunization that both Vi and O antigens should be employed.

PROPHYLACTIC INOCULATION IN MAN

Prophylactic immunization against enteric fever was first employed on a large scale in the British Army during the 1914-18 war. At first the vaccine was prepared from *Bact. typhosum* only, but towards the end of 1915 strains of *Bact. paratyphosum* A and B were added. In order to produce a satisfactory immunity it is highly important that fully virulent smooth strains

only are used. Strains that have become avirulent and show a rough colonial appearance should not be employed. The T.A.B. vaccine usually employed is prepared as follows: the organisms are grown on agar for forty-eight hours at 37° C., washed off and suspended in saline. The vaccine is killed by heating at 53° C. for one hour. It is preserved by 0.5 per cent. phenol. Each ml. contains:—

Bact. typhosum	1000 millions per ml.
Bact. paratyphosum A	750 millions per ml.
Bact. paratyphosum B	750 millions per ml.

(Reference to a new type of T.A.B. vaccine recently introduced, in which the organisms are killed by alcohol, will be made later.)

Two doses of this heat-killed vaccine, 0.5 ml. and 1 ml., are usually given by subcutaneous injection. An interval of eight to ten days should be allowed between the two injections. Slightly smaller doses may be given to women and to individuals of not too robust constitution. Young children rarely contract enteric fever and I have never given T.A.B. vaccine to a child below two years of age. At two years, two doses, each of 0.1 ml., have been given without any untoward effects, and correspondingly larger doses may be given with increasing age.

A local or a general reaction may occur after T.A.B. inoculation. In some subjects both reactions are so slight as to cause very little inconvenience. In my experience the reaction following the first injection is usually worse than that following the second, but in a few cases the reverse obtains. There is redness and swelling of varying degree, with pain and tenderness at the site of injection. The most common general symptom is headache, associated with general malaise and perhaps nausea. There may be a raised temperature. It is better to give the injection late in the day so that when symptoms arise three or four hours later the patient can retire to bed. The advice usually given to abstain from alcohol in all forms following T.A.B. vaccination is, I think, good advice. Alcohol appears to intensify the headache.

It is usually considered desirable to reinoculate every two years subjects who are living under conditions with a greater risk of infection, and for this purpose one dose only is sufficient.

THE AGGLUTINATION REACTIONS OF THE SERUM AFTER T.A.B. INOCULATION

With regard to the flagellar agglutinins, a study of the literature shows that in uninoculated individuals in this country extremely few sera show an agglutinin titre of 1:20 or over for *Bact. typhosum* and *Bact. paratyphosum*. Roughly speaking, about 5 per cent. of these sera show H. agglutination of 1:20 or over for *Bact. typhosum* and *Bact. paratyphosum* B, but practically none for *Bact. paratyphosum* A. As regards O agglutinins, such information as is available shows that about 20 per cent. of sera show a titre of 1:20 or over, but none for *Paratyphosum* A. For both H and O agglutinins the number of sera showing agglutinating titres higher than 1:20 diminishes rapidly.

Both H and O agglutinins are formed in response to T.A.B. inoculation but there is a wide variation in the behaviour of different individuals. The titres obtained for H agglutination are much higher than those for O agglutination. The O agglutinins are more transitory and disappear from the circulation in a comparatively short time, whilst the H agglutinins persist in varying degree in different individuals for many years. In my experience those for *Bact. paratyphosum* A are lost, in most cases, before those for the other two organisms. H agglutinin titres of 1:1000 or more may be developed against all three organisms within a few weeks of the inoculation. Rather higher figures may be obtained against the paratyphoid bacteria than against *Bact. typhosum*. O titres rarely exceed 1:100, and in the majority of cases have fallen below 1:20 within one to two years.

These considerations are of some importance in the serological diagnosis of enteric fever, owing to the considerable variation in the strength of the agglutinins and in their rate of disappearance in inoculated subjects. Owing to their low titre and short duration it would appear that O agglutinins may be of more significance than H agglutinins in the diagnosis of enteric fever in these cases. The O agglutinins, if found in a titre of 1:100 or more six months after inoculation and showing a rise after a few days, are highly suggestive of enteric infection but are not always present. With regard to H agglutinins in the serological diagnosis of enteric in inoculated subjects, a rise in titre for one definite organism may be significant. In many cases, however, the titre against all three organisms may be raised and, in addition, febrile conditions other than enteric, especially typhus fever, may have the same effect (anamnestic reaction). The result is that diagnosis by testing the agglutination reaction of the patient's serum is often prejudiced by previous T.A.B. inoculation. Fortunately, a few years ago a considerable advance was made in the discovery of culture media which have facilitated the isolation of organisms of the Salmonella group, especially from the fæces. Diagnosis by recovery of the causal organism from the blood or the excreta is always preferable. Individuals vary considerably in the agglutination power of the serum following T.A.B. inoculation, and the agglutination titre should not be regarded as a satisfactory measure of immunity. It is better to use the mouse-protection test. There is evidence to show that a positive blood culture is less likely to be obtained in inoculated cases (Just, 1916). It is rare for a very recently inoculated subject to contract enteric fever, and in the only two cases which I have seen, blood culture was unsuccessful.

The mortality rate from typhoid fever in this country has shown a continuous decline since the beginning of the present century until, at the present time, it is very small indeed. This statement is not equally true for all European countries. The improvement is largely due to the great advances in sanitation, viz., the disposal of sewage, the pasteurization of milk, the provision of good water supplies, which have taken place during this period. Whereas previously the incidence of typhoid fever was most marked in the densely populated areas, the cities and large towns, it is now higher in the

smaller communities, the urban and rural areas where the improvement in sanitary measures has lagged somewhat behind. Small epidemics do, however, occur from time to time in various localities, e.g., the Croydon outbreak of 1937. The importance of the carrier is now much more appreciated than formerly. In a small outbreak of paratyphoid B fever which occurred during the last war the continuation of the epidemic depended upon a succession of a small number of temporary carriers who had themselves contracted the infection and were victims of the epidemic. They had been entirely, or almost entirely, free from symptoms. The detection of carriers has become a recognized procedure in the investigation of the causes of epidemic disease. Therefore in appraising the value of the T.A.B. inoculation it is important to remember the beneficial effects of improved sanitation.

THE RESULTS OF PROPHYLACTIC IMMUNIZATION OF MAN AGAINST ENTERIC FEVER

It is common knowledge that in the Boer War the incidence of typhoid fever was very high (105 cases per 1000 of strength), and was associated with a high death rate. During this war a certain number of men were inoculated against typhoid, and Harvey (1929) gives figures showing a considerable reduction in the case mortality rate among the inoculated as compared with the uninoculated. In 1,758 inoculated subjects there were 142 deaths (8 per cent.) as against 1,800 deaths (16.6 per cent.) in 10,980 uninoculated.

Harvey (1929) also gives figures relating to the incidence of enteric fever in the British troops in India for the years 1909-13 inclusive. Immunization against typhoid had been reintroduced in 1906 and gradually increased, so that by 1909 practically all troops had been inoculated. There was a reduction in the admissions to hospital from 8.9 per 1000, with a death rate of 1.58 in 1909, to 2.3 per 1000, with a death rate of 0.25 in 1913.

At the beginning of the 1914-18 war, inoculation of the troops was begun with a vaccine containing 1000 millions of *Bact. typhosum* per ml. At first one dose of 1 ml. was given, but later two doses of 0.5 ml. and 1 ml. In the early stages of the war very few people could be inoculated, but the numbers were gradually increased until by the end of 1915 over 90 per cent. had been immunized. Owing to the number of cases of paratyphoid B fever which were encountered, *Bact. paratyphosum* A and B were added, and the T.A.B. vaccine came into use in January 1916. In the 'Official History of the War Medical Services, Pathology' (1923) a number of tables are given showing the number of cases and the case mortality from enteric fever for different periods from figures collected by Leishman (1923). Certain extracts only can be given here, and for full details reference should be made to the original. In the period August 1914 to August 1915, when vaccine prepared from *Bact. typhosum* only was used, the case mortality in the uninoculated was 20.36 per cent. against 7.44 per cent. in the inoculated. It was noted also that the disease tended to run a milder course in the latter. Another table gives the incidence of both typhoid and paratyphoid fever

among both classes for the whole of the year 1915, during which typhoid vaccine only was in use. The incidence of fever due to *Bact. typhosum* was found to be 9.5 cases per 10,000 among the inoculated as compared with 103.52 per 10,000 among the uninoculated. There was also a difference in the incidence of paratyphoid fever, which showed a rate of 21.53 per 10,000 among the inoculated and 39.84 per 10,000 among the uninoculated. This suggests that the typhoid vaccine produced some degree of group protection against paratyphoid infection. In 1917, when the strength of the British Army in France had been approximately doubled, 1,275 cases were diagnosed as enteric fever as compared with 2,760 in 1916. In 1918 only 376 cases occurred. This continuous decrease in the incidence of enteric fever cannot be attributed simply to the improvements in sanitation. At times when the conditions of warfare caused of necessity a considerable deterioration in sanitary arrangements, and produced an increase in the number of cases of diarrhœa and dysentery, an accompanying rise in the number of cases of enteric fever was not observed. This pays tribute to the protection afforded by inoculation during these difficult periods.

Pfeiffer (1922), in the cases of typhoid fever occurring in the German Army in the 1914-18 war, reported a mortality rate of 12.2 per cent. among the uninoculated as compared with 2.3 per cent. among the inoculated. Chauffard (1921) found that in France, owing to immunization in the army, typhoid fever had almost disappeared in males between the ages of twenty and forty-five, the incidence being much higher in females. In ordinary circumstances the male rate was higher than the female.

Additional evidence as to the value of T.A.B. immunization is afforded by the experiences of the 1939-45 war and is given by Boyd (1943) in an account of 'Enteric Group Fevers in Prisoners of War from the Western Desert'. In 1940-41 large numbers of Italian prisoners were taken, with the result that for a time there was insufficient accommodation. Sanitation was necessarily very inadequate. A small outbreak of typhoid fever occurred in one of the camps, but by the end of January 1941 this was got under control by the establishment of a rigid sanitary discipline and by inoculation. Owing to an inadequate supply of British T.A.B. vaccine, captured Italian vaccine was used. Two doses of 0.5 ml. and 1 ml. were given to all who had not been inoculated for two years; to the remainder 0.5 ml. only. A fresh outbreak occurred in May 1941, reached its height in July, then decreased and came to an end in September 1941. This was associated with many cases of paratyphoid A, which in July were more numerous than those of typhoid. In June 1941 all prisoners had been re-inoculated with Italian vaccine which had no obvious effect. In August, British T.A.B. vaccine had become available and two doses were given. Following this, the outbreak rapidly faded. Subsequently all new prisoners received two doses of British T.A.B. vaccine and the incidence of enteric fever remained low until November 1942, when large numbers of fresh prisoners were taken at the battle of El Alamein. Of 180 cases notified, 90 occurred within ten days or less after admission to

the camp, 44 within twenty-one days or less after inoculation, the remainder at later dates. It is not claimed that T.A.B. inoculation was the sole cause for the decline of the outbreak which came to an end in February 1943.

On the other hand, among British prisoners of war captured by the Italians in June 1942, and held under extremely bad sanitary conditions, no case of enteric fever was diagnosed, although there was a very large outbreak of dysentery amounting to between 11,000 and 12,000 cases. Yet there were numbers of cases of enteric fever among Italian troops stationed in the vicinity. It is therefore reasonable to believe that an immunity of greater degree was produced by the British vaccine as compared with the Italian vaccine. The vaccines were tested in parallel by the mouse-protection test, which confirmed the superiority of the British vaccine.

The objection has been raised that the heat-killed T.A.B. vaccine, as given by subcutaneous injection, does not give rise to the appearance of Vi antibodies in the blood stream. The Vi antigen is known to be thermolabile and is destroyed by heating at 60° C. for five minutes. It is also sensitive to phenol. It was considered that the process of killing the vaccine by heat at 55° C. for one hour and using 0.5 per cent. phenol as a preservative have a deleterious effect on this antigen. Felix therefore introduced the method of killing the organisms with 75 per cent. alcohol and of using 25 per cent. alcohol as a preservative. The dosage recommended for adult males is 0.25 ml. and 0.5 ml., with an interval of three weeks between the two injections. For women, 0.2 ml. and 0.4 ml. are recommended, and for children smaller doses according to age. With regard to the reactions following the administration of this alcohol-killed vaccine I have less experience as compared with the heat-killed vaccine, but it is thought that both local and general reactions are somewhat less than those obtained with the latter. It has been shown that whereas after immunization with the heat-killed vaccine circulating Vi antibody could rarely be demonstrated in the serum, with the alcoholized vaccine it was found in a high proportion of cases (Felix, Rainsford and Stokes, 1941). This vaccine is now on trial on a large scale, and although its value has not yet been established it is reasonable to expect that an additional advantage may be obtained by this method of preparation.

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TETANUS IMMUNIZATION

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It is a paradox that although the knowledge of how to stamp out tetanus has been available for at least ten years, approximately 200 cases, about 40 per cent. of which are fatal, continue to occur annually in this country. Two methods of prevention are now known—by passive and active immunization—and in this article an attempt will be made to show why so many patients escape protection, and to discuss any further steps which should be taken to lower the incidence.

PASSIVE IMMUNIZATION

Passive immunization of all wounded, by the injection of antitoxin as soon as possible after a wound had been sustained, was first introduced on a large scale on the Western front in September 1914. As a result the incidence of tetanus fell from 9 to 1.4 per 1000 in three months (Bruce, 1915). Since then this excellent result has improved still further, partly as a result of increasing the initial prophylactic dose in severe wounds to 3000 or even 5000 international units and of repeating the dose at weekly intervals after severe and heavily infected wounds, and partly as a result of improved surgical technique and the inhibitory effect of antibiotics on wound sepsis. If in civilian life prophylactic antitoxin could be given within twenty-four hours after all wounds infected with tetanus and repeated when they are severe, only a small fraction of the present cases would occur, and of those which did, very few would be fatal. Unfortunately, it is impossible to be certain whether a wound is infected with tetanus or not. In some it is difficult even retrospectively to see a reason for suspecting it.

Because of these difficulties it is worth while carefully considering what types of wound give rise to tetanus among the civilian population today, and whether passive immunization could be used with greater effect. It is well known that *Cl. tetani* only grows under strict anaerobic conditions, and that it produces spores which are highly resistant and may lie dormant for years outside the body and for months in the tissues when conditions for development are unfavourable. Bacilli and spores are commonly found in cultivated and manured soil in most parts of the world, and are present in large numbers in the intestinal canal of the horse, domestic animals and man. Growth in the tissues is facilitated by the presence of trauma, necrosis, foreign bodies and pyogenic or other anaerobic infections, but the determining factor, which is predisposed to by all these, is a sufficiently low oxygen tension. It follows from this that the classical wound to cause tetanus is penetrating, lacerated and infected. Since the discovery of passive immunization, backed by the experience of the 1914-18 war, prophylactic antitoxin is almost always given after such wounds, and prevents the disease developing, so that today severe injuries of this type are not often the cause

of tetanus. Instead, it follows much slighter, often trivial injuries, which have escaped passive immunization. These may be classified as follows:—

(1) Slight septic abrasions which have scabbed over, forming a cavity in which anaerobes can grow.

(2) Slight penetrating wounds as from thorns, splinters, a garden fork or nail in boot.

(3) Whitlows—especially in agricultural workers.

(4) A miscellaneous collection of lesions, the only common factor of which is that they are dirty or septic and occasionally and unexpectedly cause tetanus. They include umbilical sepsis in infancy, infection from cavities, as in puerperal sepsis, otitis media, maxillary antritis and infected tooth sockets; burns, carbuncles, septic bunions, cuts which have been stitched or sealed with plaster, varicose and other chronic ulcers, impetigo, septic scalp infections, and any chronic septic infection of the skin.

(5) From infected material used in medicine and surgery: e.g. catgut, dressings, cotton-wool, dusting powders and intramuscular injections.

(6) No visible wound (possibly internal).

It is clear from a study of these varied lesions that passive immunization could only lessen the present incidence considerably if prophylaxis could be given in every case in which the skin is broken. This is undesirable, because tetanus antitoxin itself is not entirely harmless. There are people, particularly those who suffer from allergic troubles, who are extremely sensitive to horse serum. Such subjects may die or develop very severe reactions within a few minutes of receiving the minute amount contained in a prophylactic injection of tetanus antitoxin. The immediate symptoms include breathlessness, pallor or collapse, or serum reactions may follow later. The risk of such reactions is relatively slight, but the fact that they occur makes it inadvisable to give antitoxin unless there is a genuine risk of tetanus developing. It follows that any general rule as to when tetanus antitoxin should be given is impossible, but the question should always be considered carefully in each individual case with a strong bias in favour of protection if there seems to be the most remote chance of tetanus. There must inevitably be loopholes by which certain people escape protection, as, for example, those who do not consult a doctor because the wound seems too trivial. Prophylactic antitoxin is often omitted with disastrous consequences after very slight wounds of the hand or foot which are followed by considerable sepsis. The whitlow is the best example. Ten in a series of 50 consecutive cases listed here were due to this cause, and they occurred mostly in land workers or gardeners. It is also important to remember that tetanus almost always occurs in people who are careless about keeping their hands and feet clean. Similarly, children who develop it from septic abrasions do not come from a cleanly environment. Among those who are clean in their habits it is very rare. It is clear therefore that passive immunization—even if it were applied with the greatest care and discretion in civilian life—could not entirely prevent the disease.

ACTIVE IMMUNIZATION

Ramon and Zoeller (1927) showed that active immunization against tetanus could be produced by injection of formolized toxin, called 'toxoid', and a modification of their method was used for soldiers in the British and Allied Armies before they went on active service in the war of 1939-45. To produce immunity two injections of 1 ml. are given at an interval of not less than six weeks, and a further similar injection once a year while they are serving. The first of these injections sensitizes the cells of the reticulo-endothelial system to produce antitoxin on further stimulation, either by another injection of toxoid or by the toxin of an actual infection. It is only after the second injection of toxoid that the circulating antitoxin is actually increased, and this increase is maintained by repetition of further injections of toxoid at yearly intervals. When a patient who has been actively immunized is infected with tetanus, the toxin is neutralized by the antitoxin already in the circulation. The toxin also acts like a further injection of toxoid and stimulates the production of further antitoxin, and thus the patient is in a sense doubly protected. In the British Army, an injection of prophylactic antitoxin was also given directly a man was wounded to cover any possible delay or failure in antitoxin production by his own cells, but in the American Army a further dose of toxoid (but no antitoxin) was given to stimulate antitoxin production still further. The results by both methods were wholly satisfactory and tetanus was practically stamped out.

In the B.E.F. in France in 1940, 90 per cent. were actively immunized and only 8 cases of tetanus were reported, which were all among the unprotected 10 per cent. (Benstead, 1941). In the first two years of war in the Middle East, where examination for spores of soil samples and pus from wounds showed that the risk of tetanus was still considerable, there were only 18 cases, and only 5 of these in men who had been actively immunized (Boyd and MacLennan, 1942). Further indirect evidence of the efficacy of active immunization is afforded by the very small number of other recorded cases which have followed it. The results from the American Army (Long, 1943 and 1944) were equally encouraging, and indeed more convincing, because no prophylactic antitoxin had been given. Finally, the almost complete absence of cases during the invasion of N.W. Europe confirmed these results (Boyd, 1951).

In war, the advantage of active over passive immunization is that the former can be completed before the soldier goes on active service so that he is immune to tetanus before he is wounded, and also that reactions to toxoid —now that it has been purified—are very slight and do not sensitize patients to subsequent injections of serum.

PASSIVE AND ACTIVE IMMUNIZATION IN CIVILIAN PRACTICE

The application of these methods in civilian practice presents certain difficulties. Tetanus is not at present a notifiable disease, so that exact data about its incidence are hard to obtain. The following comments are based on a series of 50 consecutive civilian patients with tetanus seen by me, mainly in East Anglia between 1928 and 1945 (Cole, 1940). They may be presumed to represent an average sample from this country and are briefly considered

for the light they throw on the practical application of passive and active immunization.

In this series (table 1) passive immunization should have been given and would have prevented about half, particularly those with severe infected wounds, most of the whitlows, and some of the penetrating wounds. In the remainder, the wound was often very slight or not seen by the doctor until the symptoms of the disease had appeared. Even if practitioners were more alert to the possibility of tetanus and gave prophylactic antitoxin more freely, it is doubtful if in practice the present incidence could be reduced by this method by more than another 20 per cent. It is worth noting that

TABLE 1

50 *Cases*		*Recovered*	*Died*
Males	44	23	21
Females ..	6	5	1
	50	28	22
Age incidence		*Recovered*	*Died*
Under 1 year	2	1	1
1 to 5 years	4	1	3
5 ,, 10 ,, ...	12	8	4
10 ,, 20 ,, ...	11	8	3
20 ,, 60 ,, ...	13	8	5
60 and over	8	2	6
	50	28	22
Type of wound			
Severe deep infected	3		
Abrasions (usually dirty with scabs)	10		
Slight penetrating wounds (as from thorns, splinters, nails or garden fork	12		
Whitlows	10		
Cuts (2 septic)	3		
Miscellaneous			
Boil on neck	1		
Otitis media	1		
Epistaxis	1		
Umbilical sepsis	1		
Chronic varicose ulcer	1		
Septic scalp	1		
Septic burn	1		
Puerperal sepsis	1		
Plaster sores (infected with grey wool) ..	2		
No wound seen	2		

most cases occur in the country, whilst medical schools are in large cities where tetanus is very rare, so that doctors entering rural practice have usually not had the salutary experience of seeing actual cases to drive home the teaching they may have received as to the particular type of wound which is dangerous.

Service experience has shown that active immunization could eradicate the disease if applied systematically to the whole population, but this would be a heavy undertaking to prevent the comparatively small number of cases

which do occur. Whether or not this should be done is partly an economic question. Conybeare and Logan (1951) have suggested that in view of the relatively high death rates from tetanus among children from five to fourteen years of age it would be justifiable and practicable to immunize school children at the age of entry, especially in rural districts. Boyd (1951) strongly recommends active immunization for agricultural workers, grooms and others who run an occupational risk of infection. The present series shows that 23 out of 50 cases occurred between the ages of five and twenty, and 13 cases between the ages of twenty and sixty; the adults mainly worked on the land. The remaining 14 consisted of 2 babies, 4 children under five, and 8 men over sixty, whose chief common attribute was that they lived in an agricultural community and were casual about cleanliness. If therefore in country districts where tetanus is endemic all school children were immunized on going to school at the age of five, and all agricultural workers, grooms, farmers and the like when they first go to work, the incidence would be greatly reduced with considerably less effort and outlay, but some people would still escape protection.

Finally, it must never be forgotten that tetanus is a dirt disease and education about care of wounds in country districts should not be omitted.

SUMMARY

The prevention of tetanus by passive and active immunization is described and the practical difficulties of applying these methods to the civilian population are discussed. Fifty consecutive observed cases are analysed from the point of view of age, sex, occupation and causal lesions and suggest the following conclusions:—

(1) Passive immunization would prevent more cases if the danger from *slight* septic wounds and whitlows in country people were remembered by doctors and taught more vigorously to students.

(2) Active immunization of school children in country districts at the age of five, and of agricultural workers of all types when they first start work, might reduce the present incidence of tetanus by more than one-half.

(3) Tetanus is a dirt disease and education of country people in wound cleanliness is important.

(4) If tetanus were made a notifiable disease information would be obtained which would be useful for defining the scope for limited active immunization among the civilian population.

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IMMUNIZATION AND AIR TRAVEL

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TRAVELLERS by air are constantly reminded, and sometimes understandably irritated, by being repeatedly subjected to internationally agreed measures taken to prevent the spread of epidemic disease from one part of the world to another. In the foreseeable future we shall travel, in jet-propelled air liners, from Cairo to London between breakfast and lunch time, and pass from a non-endemic into an endemic area and into a non-endemic area again, in the course of a day. In such circumstances the epidemiological problems will certainly not get less, and may even increase, in complexity.

Pleasant and desirable as this form of travel is to many people, the regulations encompassing international journeys by air have unfortunately become more, and not less, complicated, and not the least annoying are the health regulations, to which everyone, irrespective of rank, race, or creed, is subject. It is therefore understandable that the responsible authorities should endeavour to reduce to a minimum the essential protective requirements for travellers by air. The overriding consideration must, of course, be safety, and the minimum permissible requirements must be those which, so far as present knowledge allows, provide adequate protection for the individual and, more important, the country concerned, from the six major quarantinable diseases; namely, smallpox, yellow fever, plague, cholera, typhus and relapsing fever.

INTERNATIONAL CONTROL

International agreement and control on such matters are essential if the measures are to be effective, and to this end the epidemiology and quarantine committee of the World Health Organization has worked for the last few years in an endeavour to effect the maximum agreement on all measures deemed necessary by the subscribing countries.

A draft of the proposed International Sanitary Regulations, upon which a large measure of agreement has been reached, was recently presented to the W.H.O. assembly and, if accepted, will be sent to the respective governments for ratification. It must be clearly understood, however, that the information which is given in this article indicates suggestions and proposals only, and until they are ratified existing regulations will remain in force.

PROBLEMS OF COMPROMISE

It is inevitable when considering matters of this nature that there will be wide divergencies of opinion to be overcome, and it is to the credit of those responsible for the compilation and presentation of the regulations that many of the difficulties have been surmounted, and wide acceptance gained.

The different points of view to be considered usually consist of emphasis on a different aspect of the problem under review. Thus certain countries which are highly susceptible to a particular disease demand maximum protection, whilst others less prone to danger are not so concerned. India and Pakistan, for example, are particularly anxious to avoid the importation of yellow fever, and a similar attitude is taken with regard to smallpox in Australia. Other countries, less susceptible, are more concerned with the minimum interference to passengers and traffic, whilst a third section of the community considers that the safest procedure is for everyone to be protected against everything; a form of totalitarianism not generally acceptable to the medical ethic.

It is tacitly recognized by all interested groups that the maximum integration of conflicting interests and subordination of preconceived prejudice are desirable if the scheme is to work on an international basis. Furthermore, there must be flexibility to meet changed conditions or new protective measures. This is apparent in the existing regulations, where allowance is made for review and revision from time to time, as necessary.

POTENTIAL DISEASE HAZARDS DUE TO AIR TRAVEL

Following the first pessimistic forebodings of widespread dissemination of quarantinable diseases, which, it was thought, would occur with the advent of air travel, more reasonable counsels have prevailed, and it is now generally recognized that only two, namely smallpox and yellow fever, are likely to be spread by normal air travel. Accent is on the word 'normal', because there must be excluded from such considerations mass movements of pilgrims, refugees, or displaced persons which occur from time to time, and for which special provision will have to be made.

The normal traveller on a recognized air route, however, is unlikely to come into close contact with plague, typhus, cholera, or relapsing fever, and therefore to be a carrier or incubator of such diseases.

QUESTIONS TO BE CONSIDERED IN IMMUNIZATION PRACTICE

The effectiveness of various immunization procedures.—The established effectiveness of various immunization agents varies through a wide range, from very effective in the case of anti-smallpox vaccine, to very doubtful in the case of anti-typhus vaccine. It will thus be seen that some measures will be universally adopted, and others, only in the case of an epidemic or proven contact. There are still differences of opinion on certain types of vaccine, cholera being one, but until further evidence is available it is wise to retain existing regulations.

The itinerary.—It is obvious that the points of departure, transit and arrival will materially affect the immunization procedures a passenger will have to undergo, and in most cases these are dictated by the requirements of the country he is entering, which wishes to protect itself from the pos-

sibility of his introducing a quarantinable disease from any country from which he has come or through which he has passed.

International requirements.—These are agreed and published by the participating countries from time to time, but are liable to sudden change without previous notice by individual countries should they consider circumstances so demand. Thus re-vaccination within the agreed validity period of three years is sometimes demanded of persons who have immediately arrived from an area where there is an outbreak of smallpox, to the great inconvenience of aircrew and passengers alike, who may be completely protected in accordance with current regulations. It is to be hoped that the new regulations providing maximum protection will not be contravened in this way in the future.

Certification.—Proper certification, in internationally acceptable form, is necessary if the procedures are to be controlled adequately, and to that end an international certificate of inoculation in new format is being devised, on which necessary data will be recorded. Only certain officially approved stamps and signatures are accepted internationally, and penalties for misrepresentation may be severe.

Other preventive measures.—When other measures, such as the destruction of the disease-bearing insect or other vectors, have been shown to be effective, relaxation in immunization measures has been allowed, as in the case of typhus and plague, except when an epidemic is present.

SPECIFIC IMMUNIZATION PROCEDURES

Smallpox.—Vaccination is carried out by making one dermal scratch, applying lymph, and subsequently making one or two further scratches through this lymph. Deep scarification is not necessary, and is in fact undesirable. The certificate will be valid immediately for three years. The present method of recording results as primary vaccinia, vaccinoid reaction, or reaction of immunity, will be abolished, the terms 'positive' and 'negative' only being used to describe the reaction.

Yellow fever.—One injection of 0.5 ml. of anti-yellow fever vaccine (0.15 ml. for children under two years) will be accepted as producing a period of immunity of four years, dating from ten days after the inoculation. It is anticipated that certain areas in which the Aëdes index is kept below a certain figure (1 per cent.) will not be nominated endemic yellow fever zones.

Smallpox and yellow fever combined immunization procedure.—It may be the case, particularly in air travel, that protection against both smallpox and yellow fever are required at short notice. In such circumstances the following procedure, as recommended by the Ministry of Health, should be adopted:—

(1) Whenever possible yellow fever inoculation should precede primary vaccination by not less than four days.

(2) If primary vaccination has been carried out, twenty-one days should elapse before yellow fever inoculation is given.

(3) When previous vaccination has taken place, yellow fever inoculation and re-vaccination may be carried out at the same time, if absolutely necessary.

Cholera.—Anti-cholera vaccine is variable in its action. Thus it is notoriously uncertain in conferring personal immunity, whereas its efficacy, in single doses, in raising the level of immunity of large masses of people, has been proved in India to be adequate to prevent the build-up of an outbreak to epidemic proportions. Its effectiveness for passenger immunization is therefore open to question, and there are those who think it should be waived on that account, other than in exceptional circumstances or epidemics.

At present, however, dosage for adults consists of one injection of an amount of anti-cholera vaccine, containing not less than 8000 million vibrios; half this dose is used for children of six to twelve years, and a quarter dose for children of two to five years. The period of validity is six months from the date of inoculation.

Plague and typhus.—It is now well recognized that it is extremely unlikely that air travellers will come into intimate contact with plague or typhus, and the unsatisfactory results with the latter vaccine have led to the abolition of regulations demanding its use. It is possible that in the future similar measures will apply in the case of plague.

Relapsing fever.—This disease cannot, in the present state of our knowledge, be prevented by any vaccine. Protective measures are therefore limited to dealing with the insect vectors.

PROTECTION AGAINST OTHER DISEASES

Whilst not coming under the heading of quarantinable or epidemic diseases, it is desirable to obtain protection against certain other diseases when travelling. Because they do not come under either of the previously mentioned headings, such protection is recommended but not insisted upon.

Typhoid group.—Typhoid is a universal disease, and as such its spread will not be curtailed by inoculation measures, or increased by the movements of unprotected air travellers. On account of the uncertainty of sanitary facilities abroad, however, the traveller is advised to have anti-typhoid vaccination for his own protection. The first dose for adults is 0.25 ml., followed by a further dose of 0.5 ml. in ten days' time, with proportionately smaller doses for children. The period of validity is one year, and the annual booster dose 0.25 ml.

Malaria.—This disease is widely spread throughout the world, and any traveller who is likely to pass through malarial areas will be well advised to take precautions to prevent himself contracting the disease. As well as the usual protective measures, including the use of a mosquito net and mosquito repellent, such as dimethylphthallate, and the wearing of protective clothing after sundown, the taking of a well-known malaria preventative such as 'paludrine' is highly effective in suppressing any infection which may have

occurred. The recommended dosage is one tablet daily while in a malarial area, and thereafter for six weeks after leaving the area. There is no discomfort or discoloration of the skin with paludrine as may be the case with other remedies.

CONCLUSIONS

It will be seen that for the international traveller by air, immunization is compulsory in some cases, desirable in others, and will vary in accordance with the route covered and the countries visited. Thus vaccination is an almost universal requirement, and other protective measures are required in varying degrees. There are no regulations concerning typhoid or malaria, but the prospective traveller would be wise to protect himself against them.

A sincere effort has been made by the countries concerned to simplify health regulations as much as possible, in order to give passengers the minimum amount of trouble, but it is obvious that there are certain minimal safety levels, below which they cannot go without imperilling the health of the communities for which they are responsible. The efficacy of some of the measures used is admittedly open to dispute but, in the interests of universal safety, until satisfactory proof one way or the other is produced, hasty changes cannot be made. Further preventive measures which prove effective in reducing the endemicity of an area or zone may materially alter the protective measures required.

It is anticipated that the measures newly agreed by the World Health Organization will be ratified by the respective governments within a year, when they will be authoritatively published, but until then, and thereafter, the prospective traveller may obtain current information on immunization requirements from the offices of any reputable air line, or specifically in this country from B.O.A.C. Medical Department, Airways House, Great West Road, Brentford, Middlesex (Telephone, Ealing 7777). He may rest assured that if he carries out the regulations and recommendations given for his particular itinerary, he will be adequately protected against any of the diseases he is likely to encounter on his travels, and will not be delayed unduly by formalities *en route*, provided the measures taken are properly recorded in approved form.

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BEAT KNEE

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THE presence of abnormal states in and around the knee joint in miners has long been recognized. In 1907, a report from the Departmental Commission on Compensation for Industrial Diseases recommended that the diseases known as beat knee, beat hand and beat elbow should be included in the schedule to the Workmen's Compensation Act, 1906. The recommendation was accepted. Since the operation of the Industrial Injuries Act, 1946, they are included in the First Schedule to the National Insurance (Industrial Injuries) (Prescribed Diseases) Regulations, 1948. Beat knee is described as 'a subcutaneous cellulitis or acute bursitis arising at or about the knee'. The nature of the associated occupation is described as 'manual labour causing severe or prolonged friction or pressure at or about the knee'. In

TABLE 1

BEAT KNEE: GREAT BRITAIN
FREQUENCY RATES

Year	Number of cases of beat knee*	Number employed underground†	Cases per 1,000 employed underground	Output of saleable coal (tons)†	Cases per 1,000,000 tons
1937	4,199	616,700	6.82	240,409,436	17.4
1938	4,065	619,900	6.57	226,993,200	17.9
1939	4,276	604,200	7.09	231,337,900	18.5
1940	4,324	585,900	7.52	224,298,800	19.3
1941	4,722	540,800	8.74	206,344,300	22.9
1942	5,062	548,100	9.24	203,633,400	24.9
1943	5,300	546,500	9.71	194,493,000	27.1
1944	5,153	550,500	9.29	184,098,400	28.0
1945	5,253	550,300	9.47	174,657,900	30.1
1946	5,356	537,500	9.96	181,243,000	29.6
1947	5,488	549,600	9.98	187,202,800	29.1

*Ministry of Fuel and Power (H/S Stats/59), May, 1950.
†Colliery Year Books and Coal Trade Directories.

the coal mining industry beat knee is one of the most serious health hazards yet to be dealt with in a satisfactory manner.

In any method of coal getting an essential in the task is the breaking down of the seam. In this process large quantities of small sharp coal particles are unavoidably created. Where the height of the seam compels those engaged in the getting of coal to kneel, the predisposing factors for beat knee will always exist. It is likely that future technical developments in mining, which may include the working of thinner seams with increased mechanization, will increase the size of the problem. Although the causes of beat knee were examined and stressed by Collis and Llewellyn as long ago as 1924, the

practical measures to reduce the incidence and severity of the disease appear largely to have been confined to the use of protective pads. There has been insufficient appreciation of the other recommendations made by Collis and Llewellyn. The main purpose of this article is to give a picture of the problem in relation to an important coal-mining region in the country (the East Midlands), and to recommend what appear from experience to be the most practical measures to deal with the problem.

In many collieries in the East Midlands Division the measures advocated for the reduction of disability from beat knee are in operation. It cannot be too strongly emphasized, however, that for any degree of success to be obtained there must be complete cooperation between the workmen and those responsible for the execution of the measures recommended.

THE SIZE OF THE PROBLEM

The extent of the problem of beat knee nationally is shown in table 1. The incidence of the disease during recent years in the East Midlands Division is shown in table 2.

TABLE 2

BEAT KNEE: EAST MIDLANDS DIVISION
Frequency Rates

Year	Number of Cases†	Number employed below ground‡	Annual No. of cases per 1000 employed below ground	Output saleable tons‡	Cases per 1,000,000 tons
1948	1,620	74,722	21·68	37,000,000	43·7
1949	2,103	75,457	27·87	39,000,000	54·03
*1950	1,204	74,537	33·33	20,000,000	59·6

*Provisional for first six months only.
†Returns of Accident and Industrial Disease by the Divisional Safety Engineer of the East Midlands Division of the National Coal Board.
‡Annual Report of the National Coal Board.

It would appear that the incidence of the disease is on the increase nationally and in the East Midlands Division. Whether or not the incidence of the disease has reached its peak it is difficult to state. The trend of modern mining methods would appear to reinforce the conclusion that it has not.

Beat knee is by far the most frequent and serious of the industrial diseases associated with coal mining in the Division. Its position relative to other conditions is shown in table 3.

On the basis of the output per manshift of all employed, the shifts lost due to beat knee—52,575 in 1949—would be equivalent to a loss of about 90,000 tons. From table 4 it will be seen that the incidence of beat knee is confined almost entirely to coal face workers and, on the basis of output per face manshift, the loss is the equivalent of 230,000 tons of coal.

OCCUPATIONAL DISTRIBUTION

An analysis of 1,468 cases over the years 1946 and 1947 shows that the incidence of the disease is highest among those men whose work involves much kneeling (table 4).

TABLE 3

BEAT KNEE: EAST MIDLANDS DIVISION
1949
Comparison of Severity Rates—Certificated Absence

Manshifts worked*	Number of shifts lost due to			Shifts lost per 100,000 man-shifts worked		
	Accidents*	Industrial disease (including beat knee)*	Beat knee only	Accidents	Industrial disease (including beat knee)	Beat-knee only
23,690,785	621,525	64,219	52,575	2,625	271	221

*Returns of Accident and Industrial Disease by the Divisional Safety Engineer of the East Midlands Division of the National Coal Board.

In table 3 the total number of shifts shown as lost as a result of beat knee has been obtained by allowing 25 shifts lost for each of the 2,103 cases reported in 1949. This figure has been obtained by working out an average time off per case for some 200 cases in 1949, drawn from various parts of the Division. The actual figure arrived at was 26 and, in the judgment of experienced observers, this is a fair assessment.

TABLE 4*

BEAT KNEE: YEARS 1946 AND 1947
Occupational Distribution

Occupation	Number of cases		Percentage of total cases	
	1946†	1947‡	1946	1947
Colliers	534	357	61.5	59.5
Machinemen	44	30	5.1	5.0
Conveyor flitters	68	34	7.8	5.7
Packers and prop withdrawers	85	70	9.8	11.7
Face rippers	75	55	8.6	9.2
Haulage	9	3	1.0	0.5
Road repairers	17	9	2.0	1.5
Others	36	42	4.1	7.0
TOTAL all categories	868	600	100	100

*Table 4 is compiled from figures collected from mines now in the East Midlands Division of the National Coal Board. Those collected by the Midland Colliery Owners' Mutual Indemnity Company for the year 1946 refer to 56 mines. Those collected by the Insurance Manager of the East Midlands Division for the year 1947 refer to 39 mines.

†Records of the Midland Colliery Owners' Mutual Indemnity Company.

‡Returns collected by the Divisional Insurance Manager of the East Midlands Division of the National Coal Board.

In 1946 and 1947, face workers on colliery books comprised about 40 per cent. of all employed in the East Midlands Division of the National Coal Board. This would include all the employment categories listed, except haulage, road repairers

and others. In other words, over 90 per cent. of the cases listed are drawn from face workers. No figures are available of the actual number of men at risk in each of these categories for these years. In 1945, however, for the whole country, colliers formed about 30 per cent. of all underground workers (M.F.P. Stats. Digest Table 14). This grade provided 60 per cent. of all cases of beat knee in 1946 and 1947.

AGE DISTRIBUTION

Table 5 shows the incidence of beat knee by age groups:—

The incidence is highest between the ages of twenty and forty-five and there is probably a percentage increase in incidence between the ages of twenty to thirty. It is not possible to deduce this for certainty since the figures for age distribution of all employed are for 1945, and it is probable that post-war recruitment to the mining industry increased the 25 to 35 age-groups to more normal proportions. In any event the only certain method of proving this is by comparing incidence among age-groups under directly comparable conditions, such as occupation and physical surroundings. This information is not available.

TABLE 5

BEAT KNEE: YEARS 1946 AND 1947
Age Distribution

Age in years	Number of cases		Percentage of total cases		Age distribution for average No. on colliery books 1945—Percentage‡
	1946*	1947†	1946	1947	
15	18	14	2.1	2.33	11.8
–20	160	108	18.4	18.0	14.0
–25	141	98	16.2	16.33	7.3
–30	118	93	13.6	15.5	10.7
–35	134	76	15.4	12.66	12.6
–40	114	90	13.1	15.0	12.1
–45	107	58	12.3	9.66	9.2
–50	40	34	4.6	5.66	8.0
–55	23	15	2.6	2.5	6.8
–60	12	12	1.4	2.0	4.1
–65	1	2	0.1	0.33	3.4
TOTAL all ages	868	600	100	100	100

*Records of the Midland Colliery Owners' Mutual Indemnity Company.
†Returns collected by the Divisional Insurance Manager of the East Midlands Division of the National Coal Board.
‡Ministry of Fuel and Power Statistical Digest, 1945.

THE CLINICAL PICTURE

Two types of beat knee can be described:—

The 'bursitis' type.—There is enlargement of the bursa over the upper part of the shin bone. The enlargement may be primary or the exacerbation of a pre-existing chronic bursitis. It may result from a definite trauma. An associated cellulitis may develop as a result of infection.

The 'cellulitis' type.—There is an acute cellulitis involving the tissues over the upper part of the shin bone and the knee. There may be a sympathetic reaction in the bursæ around and in the joint.

Secondary reactions or manifestations may display themselves in other parts of the body. The state is serious and demands urgent and effective

treatment if disability is to be avoided and life not endangered. In each case the skin over the upper part of the shin bone is usually thickened and the anterior tubercle of the tibia may be prominent. The simple bursitis type may be regarded as a tissue reaction due to repeated trauma; the cellulitis type as the result of the same factors operating with the superadded infection reaction. Combination patterns of both clinical types may be seen.

As a rule, the attention of the man is drawn to the state of his knee by tenderness or redness over the front of it. The physical disturbance is often insufficient to prevent his carrying on with his work. In the ordinary course of events, if the abnormality is not dealt with effectively at this stage and the man returns to the environment which contributed to the occurrence, then the state of the knee deteriorates, with increasing pain, redness and disability. Constitutional as well as local disturbance may occur, and the individual is compelled to give up work for a period which is determined by the reaction to treatment.

CAUSATION

The determining factor in all serious cases of beat knee causing disability is the introduction of infection into the tissues at or about the knee. Whilst the underlying factor may be repeated trauma, usually associated with the method and environment of work, the determining factor in serious cases is infection. The introduction of an infective element, either from sources within the body or from outside the body through a break in the skin, produces the occasion for the diseased state to arise.

Thus, the principal environmental factors involved in the incidence of beat knee may be stated as:—(1) Thickness of seam; (2) occupation; (3) type of floor; (4) personal protection.

Thickness of seam.—The condition is most common among men who work in seams between 2½ to 3½ feet in thickness (table 6).

TABLE 6

BEAT KNEE: 1938
Incidence by Seam Thickness*

Average height at coal face	No. of coal face men	No. wearing knee pads	No. of cases	No. wearing knee pads as percentage of all face men	No. of cases as percentage of face men
Up to 3′ 6″	4,932	3,836	193	78	3·9
From 3′ 6″ to 5′ 0″	7,561	2,758	119	36	1·8
Over 5′ 0″	2,588	35	2	1·3	0·077

*Midland Colliery Owners' Mutual Indemnity Company Limited. Figures are for 19 collieries now in East Midlands Division.

Occupation.—The incidence of the disease is highest among those engaged in work which involves crawling and kneeling (see table 4).

Type of floor.—There appears to be an unproven association between beat

knee and hard floors and wet floors. The association is a reasonable assumption as in each case environmental conditions exist which render the normal healthy skin barrier over the knee area more readily accessible to infection by micro-organisms.

Personal protection.—It is to be expected that, on the whole, the younger men will not have the same experience or willingness to take care of themselves as older men. This question of personal attitude is best dealt with later, but it should be noted at this stage that of the above mentioned factors there is no remedy for kneeling, and labour will continue to be 'green' and have 'soft' knees; only in personal attitude is there an amenable factor.

Other factors such as incline of the floor, type of knee pad, size of mine and mechanization have been discussed from time to time, but their part in the incidence is not clear and is probably small.

THE REMEDY

The methods of dealing with this condition fall under the headings of prevention and cure. In my opinion, in this disease the latter is the more important and will be the more fruitful of results. For other diseases, such as pneumoconiosis and nystagmus, for instance, the main line of attack is prevention by improving environmental and physical conditions. Until miners do not have to kneel, or until coal no longer breaks up into sharp particles, a similar approach cannot be made to beat knee.

PREVENTION

The two chief methods of prevention are the maintenance of a clean and healthy skin and protection of that skin by suitable devices. A clean and healthy skin is best achieved by facilities for washing—pithead baths—and the intelligent use of suitable antiseptics. The routine use of methylated spirit has been advocated, but in my opinion it should be avoided. Whilst it has some uses, especially to harden the skin on resumption of work after enforced idleness, constant and unskilful use may destroy the natural health of the skin barrier. It also causes delay in reporting for proper treatment.

The number and variety of pads which have been designed, manufactured, recommended, used and discarded from time to time indicate that no one type of pad is suitable to all persons, and that the use of present-day pads in themselves is inadequate to deal with the problem of prevention of beat knee. The difficulty with most types of pads is that in the course of work small sharp particles of coal insinuate themselves between the skin of the knee, the upper shin and the interior of the pad. Thus pressure by the knee and against the hard outer protective casing of the pad brings the sharp coal particles against the skin. Then, if the skin is broken, the way is open to infection of the tissues and a serious 'beat'. Where miners have to kneel for continuous periods under environmental conditions contributing to the disease, the chance of reducing the incidence of the disease by the use of pads alone is small.

CURE

The determining factor in all serious cases of beat knee causing disability is infection of tissues of lowered resistance by pathogenic micro-organisms, usually staphylococci or streptococci. The repeated trauma due to kneeling sets up a ready-made state so that either simple bursitis or the cellulitis type can occur very easily.

The main attack on this problem should be to catch the condition before it becomes disabling and thereby reduce the compensable incidence and the amount of time off work. In the early stages the physical disturbance to the man is mostly insufficient to prevent his carrying on with his normal work. Most men are unaware of the significance of small injuries about the knee. The first requirement therefore is to make the man aware of these early signs and possible dangers and so to develop a new personal attitude to the condition. As a corollary, adequate facilities for early diagnosis and effective treatment must be available. Sufficiently early diagnosis and the necessary adequate treatment are usually outside the scope of the average first-aid organization. The importance of this was stressed by Collis (1925).

Table 7 shows what can be done at mines where the men have been taught to be aware of the early signs of this condition, and where there is expert advice and treatment available from a State Registered nurse under medical direction.

TABLE 7
BEAT KNEE: AVERAGE TIME LOST*

Colliery	Period	No. of cases	Total shifts lost	Average time lost all cases	Average time lost per compensable case
A	1.4.50 — 30.9.50	42	399	9·5	24·9
B	1.4.50 — 30.9.50	63	324	5·1	13
C	1.4.50 — 30.9.50	46	308	6·7	20

*Divisional Medical Officer's returns to National Coal Board.

The important factor here is that there are men included suffering from a 'beat' under 'number of cases' who lost no time at all or only a few days. When men continue to work until the 'beat' state becomes compensable, disability will rise to the average of 25 days, as stated previously.

CONCLUSION

It is important to avoid loss of production and to reduce the amount of human suffering. The individual who suffers is usually a face man (one engaged in the getting of coal). The need is to keep that individual at work. This can only be done by effectively treating the sufferer so as to enable him to continue at suitable work, or by resting the affected part while it passes the acute phase. To enable the men to remain at work, and at the same time to ensure that the period of disability is reduced to a minimum, it is essential that during this early stage suitable alternative work that does not involve kneeling should be available. For this purpose it is necessary that three

should be the fullest cooperation between the men, management, and medical services.

Although the cost of beat knee in the mining industry cannot be assessed exactly, it involves loss of production and human suffering. It cannot be too strongly emphasized that any success in reducing the size of the problem will be reflected in increased production and the well-being of those employed.

SUMMARY

The continued high incidence of beat knee among coal miners is important because of the amount of suffering and disability caused, with consequent loss to the industry of skilled manpower and therefore production.

The important factors in the cause of beat knee are:—(1) Repeated trauma, which may be termed the predisposing factor, and which usually arises from conditions of work such as kneeling in narrow seams. (2) The infection of tissues of lowered resistance by pathogens. This usually arises from sources associated with the individual and may be termed the determining factor.

Since little can be done to alter the predisposing factors, the most fruitful course is to concentrate on reducing the period of disability. To do this, the following are necessary:—

(a) Education of the worker exposed to the risk in (i) the significance of maintaining in healthy state the skin and tissues about the knee, (ii) the importance of seeking and obtaining skilled advice and treatment of any abnormality, (iii) the intelligent use of suitable pads.

(b) The provision of adequate facilities for early diagnosis and effective treatment at the mine. These are essential if the disability is to be reduced to a minimum. Where such facilities exist, results show their value.

(c) The cooperation of management, under medical supervision, to provide suitable alternative employment for men still at work but suffering from states which might cause disabling absence.

The views expressed are the author's. I am indebted to the National Coal Board for access to their records.

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SOME CAUSES OF DELAYED RECOVERY AFTER ACCIDENTS

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This generation, lay as well as medical, is too X-ray-minded, in the sense that if an X-ray shows no obvious break or disease of bone the practitioner and the relatives are inclined to think that the patient has no right to have a pain or a grouse. This view is often taken, regardless of the fact that the X-ray may have been taken in the wrong place, or with faulty technique. This condemnation of X-ray consciousness is not to be interpreted as a plea to omit X-ray examination in any serious accident to bone or joint, but the X-ray must be used to confirm and clarify the clinical findings and not become the master of the practitioner, as it often does. It is often forgotten, for instance, that children tend to point to a knee, when actually a hip has been injured, and naturally an X-ray of the knee shows normal structures. It is often overlooked that in a limb, or portion of the trunk, there are, in addition to bones which may be cracked by a blow, or snapped by indirect strain, numerous other structures which can be injured instead, or simultaneously.

LIGAMENTS, MUSCLE-BELLIES, AND TENDONS

One of the most common sites of injury is a *ligament*, which when torn from its attachment may take a flake of bone with it. There may be associated fluid in the joint and reflex inhibition of the muscles or spasm. As the inner ligament of the knee is most subjected to strain and the tenderness is close to the joint line, injuries to it are often diagnosed as torn cartilage or, if the practitioner is non-committal, 'internal derangement'. A late X-ray may show new bone at the site of detachment, but the flake is often masked in the early stages. This new bone may remain tender for weeks.

Muscle-bellies are far more often torn than is recognized: first, because the tear is apt to be at some distance from the trauma and bruising; secondly, because they result in early reflex atony and lengthening of the muscle (Nature's attempt to get the ends to meet), whilst the tumour formed by the retracted upper end only develops slowly after some days. Again, prolonged tenderness and inhibition of movement are common.

The *tendons* torn are usually the long ones, but a short tendon may be detached with or without a flake of bone. Fractures of the olecranon and patella are really such tears. The tear of a deep tendon, e.g. psoas, may be difficult to recognize. Tendons torn within their sheaths may unite spontaneously but, owing to the reflex atony of the belly, the muscle tends to remain permanently lengthened and weak. This is apt to happen with tears

of the gastrocnemius, if the lesion is not recognized early and the heel supported for a long time.

NERVES

Nerves are often over-stretched by an injury, which may or may not fracture a bone or dislocate a joint. If such injuries are not carefully looked for, the late paresis, or neuralgia, is apt to be blamed upon the practitioner's treatment, e.g. tight plaster, or rough manipulation. What is often forgotten is that even after complete nerve division there is no characteristic muscle wasting for days or even weeks. Careful testing of function on strictly anatomical lines is essential, but is not easy to carry out in a patient who has extensive bruising and muscle spasm from the associated injuries. What is not well known is that it is possible to cause a complete arm paralysis from traction on the brachial plexus in reducing an obstinate fracture-dislocation of the elbow. All elbow injuries should have a careful test of the function of the hand before any treatment is given, for the nerves are easily damaged by bone fragments, the blood supply interfered with, and these lesions are aggravated if an attempt is made to sling the limb up in much flexion before complete reduction has been attained. Some of the ulnar lesions develop long afterwards from growth of the joint into valgus following disturbance of the epiphysis; these are the cases which respond well to transposition of the nerve to the front of the joint, so as to shorten its course. What is often forgotten in examining for ulnar nerve injuries is that the fingers can be flexed into the palm, but the grip is greatly weakened by loss of the intrinsic muscles which should flex the knuckles strongly. The intact outer two lumbricals supplied by the median nerve do not seem to compensate for the loss of all the interossei. As regards operation on a nerve when recovery is delayed, with modern technique exploration can do no harm, whereas delay, if the lesion should be complete, jeopardizes the ultimate result. General practitioners often tend to advise the patient to wait hopefully, instead of referring him at once to a specialist.

The median nerve is often injured with a *Colles'* fracture and may cause tiresome tingling or anæsthesia of thumb and index finger for a long time. The involvement of the musculo-spiral nerve in fracture of the humerus is familiar to all, but the damage to the posterior interosseous and its twigs may be overlooked if some branches to the wrist extensors are intact.

TENDON SHEATH INJURIES

Small injuries of tendon sheaths, or of a few fibres within the sheath, are very common and as such represent one of the most frequent causes of prolonged convalescence, if they are not sought for and treated. They probably precede many fractures. In the common skiing fracture, with the chip fracture of the front of the tibia and the spiral fracture of the external malleolus, the extensor tendons are probably torn slightly while the ski is caught in soft snow, anchoring the toe; then, when the body comes forward, the bones give way. It is preventable by throwing the body forward very

rapidly as soon as the toe sticks, so that stress on the dorsiflexors is avoided. Adhesions of these extensor sheaths are common after any ankle or leg fracture and, however well the bone may unite, while the patient is taking exercise in a walking-plaster he is not giving the normal range and lubrication to these tendons. What is surprising is that quite young children may be kept lame and subject to swelling in this region for as long as a year, and yet can be relieved in a few minutes by judicious manipulation of the tendons in their sheaths. It seems obvious that no case should be called 'cured' until a range of movement of all the joints exactly equal to the sound side is obtained; a point much overlooked by house surgeons who handle these cases in casualty departments, whilst the family doctor has a feeling that if the hospital has discharged the patient he has no right to have any symptoms.

FIBRO-CARTILAGES AND BURSÆ

Fibro-cartilages are in everybody's mind when examining knee injuries, but get less attention at the wrist. Modern X-ray technique has enabled many of the soft structures to be studied, and it has been shown that tough adhesions, limiting the free play of the triangular cartilage on the lower end of the ulna, can be a source of persistent pain after a wrist fracture. Sometimes it can be freed by manipulation, but occasionally needs complete excision. It is often overlooked that a wrist fracture inevitably has some effect on the lower radio-ulnar joint, even if only by organized blood clot, and therefore it is necessary to restore full rotation of the forearm. As the range of this movement varies considerably in different individuals, it is essential to make the two sides match.

Bursæ are structures that are almost inevitably damaged in association with a severe limb injury, and if they lose their lubricating function they can be a great source of discomfort. The semi-membranosus bursa at the knee is one of the most commonly affected. As it can usually be emptied into the joint and its neck lies under the posterior capsule and semi-membranosus expansion, it is then not palpable and can be quite difficult to diagnose. Usually, even when it has been emptied, it shows a local area of acute deep tenderness, by which it can be diagnosed. Large ones may need excision; a major operation, for it has to be dissected off the popliteal nerves and vessels to which it may be adherent. Often it can be cleared up by gentle stroking in of 'iodex', with occasional heavy massage by an expert.

The supraspinatus bursa has acquired wide publicity and is a fruitful source of obstinate pain in the shoulder. It may be injured alone, or with a tear of the tendon attachment, but often complicates fractures of the upper end of the humerus. As these are common in aged people, who show no enthusiasm for violent rhythmic exercises, and usually are unwilling for an open operation, it may be difficult to clear up. One point not always appreciated is that the calcified bursa, easily spotted in X-rays, has really undergone Nature's cure and it is the one *not* shown in the film which is likely to be troublesome.

ARTICULAR CARTILAGE

Bruising of articular cartilage is another result of severe trauma, which may occur alone, or be associated with subsequent fracture, and it forms a dangerous complication, for the splinting of the fracture does not favour a return of nutrition to the cartilage. Even if movement is not greatly limited in the early stages, the lesion may be the start of chronic osteoarthritis. In a child the intermittent limp may suggest early tuberculosis, of which, indeed, mild injury is often the exciting cause. The treatment is the same: bed, and traction to the limb. The pure trauma case will not run a temperature or show alteration of the sedimentation rate, whereas early tuberculosis probably does both, although very insidious forms exist. Bruising of the articular cartilage of the head of the humerus and the head of the radius causes obstinate discomfort. Any exercises applied to such cases must be very gentle and preferably carried out floating in hot water or, if that is not available in these days of fuel shortage, suspended on springs of the Guthrie-Smith type; but care must be taken that the action of the spring is not such as to compress the cartilage.

GROWING EPIPHYSES

Injuries to the growing epiphyses are also more frequent than is commonly supposed and their full effects may be delayed for months or years, if they disturb normal growth without actually causing separation. Those that are separated and fully reduced may still have unfavourable effects on growth, of which the parents should be warned. The one most often overlooked is displacement of the femoral neck upwards on the head, which usually results from a quite trivial injury. The symptoms are: walking with the toes pointed out, due to fixed external rotation of the joint; also lordosis, compensating fixed flexion and rather vague aching, which is often referred to the knee. The slightest suggestion of these symptoms indicates X-ray examination, for in the very early stages complete reduction is possible, whereas after even a few weeks the displacement may not yield to manipulation. It is the fashion now to hasten union after reduction by a Smith-Petersen nail, but this would hinder improvement in an unreduced case. Cases even of a year's standing can be gradually coaxed into growing back towards normal by a series of plasters in internal rotation and extension. Although most of these never show completely normal X-rays, yet the function of the hip may be normal. The muscles remain weak for a long time, so the glutei should be rested by taking the prone position whenever possible.

Trauma applied to other epiphyses, such as the wrist and knee, may show no X-ray changes at first, but growth may lag in one side of the epiphysis, causing severe joint deformity, and even if this is overcorrected by an osteotomy, the faulty growth may continue until adult life. Nevertheless, it seems wiser to correct the alignment by two or more successive osteotomies than to wait and have to deal with a condition in which the mechanics of the whole limb are grossly faulty. Failure to reduce the internal epicondyle

of the humerus, although it may show little deformity at the time, is apt to lead to a disabling bowing of the elbow. These small bone fragments often need stitching or pinning in place.

SOME IMPORTANT LESIONS

The neck.—The common flexion injury from somersaulting off a horse or cycle, may (a) crush a vertebral body, commonly the 5th and 6th cervical; (b) tear the trapezius or other scapular muscle as the patient stretches out a hand to save himself; (c) overstretch the brachial plexus, particularly the 5th and 6th cords which run the longest free course; or (d) it may do all three. Immediately after the accident, diagnosis is difficult, but fixation of the neck helps all three. Later, if all are not treated, prolonged discomfort will remain.

The spine below the neck.—Forcible flexion is most apt to give a crush fracture near the lumbo-thoracic junction, but what is not always appreciated is that the symptoms may not be severe until long afterwards, when secondary collapse of bone may induce a paraplegia, or osteoarthritic changes in the distorted spinal joints, often at a considerable distance from the fracture, e.g., the lumbo-sacral joints. Hyperextension of the spine, as in a faulty high-dive, may cause a tear of the anterior ligament, with or without a chip from the front of the spine. Here symptoms may be very ill-defined; so in persistent 'lumbago' after old injury the whole spine should be X-rayed, and a lateral view is essential. Tears of intervertebral discs have been shown to be common, but there must have been a lot of spontaneous recoveries before the army of neurosurgeons arrived.

The chest.—Everyone tests for a fractured rib after a chest crush, but many of these do not show in X-rays until new callus has formed. Few people seem to realize that the crushing injury bruises muscles, such as the pectorals, which are crushed against hard ribs. The consequent bleeding into the muscle, followed by adhesions which are partially stretched at every breath or arm movement (or indeed at any toe movement), can make the patient's life a misery for weeks. These bruises need treating by heat followed up by gentle rubbing in of 'iodex', and once a day one real long stretch, even if painful. Most patients will be courageous, if it is explained to them that the alternative is one sharp stab instead of weeks of dull ache.

The pelvis.—The existence of small displacements of the tight sacro-iliac joints is not so common as was preached before the days of stereo-X-rays, and Sir Robert Jones used to say that most of those so diagnosed were in reality small tears of the erector spinæ, which may give the most unpleasant symptoms for years, although they generally clear up with deep heavy massage. If they are associated with postural defects, which much delay recovery, it may be advisable to fit a light brace, or in women a firm corset. What are sometimes overlooked are injuries to the softened sacro-iliac ligaments in a confinement. If the bottom of the back is supported immediately by firm strapping from crest to crest, healing soon occurs, but

if left untreated and a faulty posture is allowed to aggravate them, prolonged misery can result, especially as the mother usually has to strain her back by carrying the baby and doing extra domestic duties.

The knee presents many problems of diagnosis. A small effusion and slight spasm of the hamstrings may represent a slipped patella, a torn internal lateral ligament or semilunar cartilage, or early tuberculosis, or even a quadriceps tear. There is one peculiarity about tears of muscle bellies, i.e., that they are associated with acute pain on coughing. The relatives are apt to label the patient 'neurotic' if he complains of agony in the knee when he coughs, but, of course, every muscle in the body changes its tone when any other contracts forcibly.

The ankle is the seat of many bone injuries, most of which these days find their way to fracture services, but the associated tendon and nerve injuries are easily overlooked while attending to a difficult bone lesion. In this joint also, early tuberculosis is apt to present itself as a sprain, and therefore when sprains take months to clear up this possibility should be borne in mind.

Sprains of *the foot* below the ankle quite often represent tarsal or metatarsal cracks, which will give ultimate poor function if not supported in the correct position from the start. The 'march fracture' of the second or third metatarsal has been much discussed recently, but other bone lesions occur, and the swelling compressed under the tense fascia varies little with any.

The shoulder is a region much subject to injury and difficult of diagnosis because so many important structures are packed so tightly together. Cracks of the neck of the humerus are easy to miss, if there is impaction, but they may give trouble later. The supra-spinatus bursa has already been referred to. The main diagnostic points are that acute tenderness is localized to just below the tip of the acromium and the pain is felt badly only as the shoulder reaches right-angled abduction, whether in going up, or down. Adhesions in the long head of the biceps are common after any shoulder injury. The pain is aggravated by pushing the arm backwards as far as possible with the elbow straight and the forearm pronated, which puts the tendon to its maximum stretch, and it is this manœuvre which after a moment's aggravation of pain produces dramatic cure. If done under anæsthesia the slack muscle and sheath move together and no freeing is obtained. A tear of the short head is an uncommon injury and hard to recognize, but is shown chiefly by tenderness over the coracoid.

The ligaments of *the clavicle* are often torn, when the bone does not snap, and great weakness may be left behind if the limb is not supported so as to take all strain off them for some weeks. This is well worth while, for otherwise the pain may last for months and an operative reconstruction of the ligaments be required.

The complexities of injuries round *the elbow* have already been referred to, and it now seems generally recognized that a fracture of the elbow region in a child may be one of the most serious conditions with which a fracture service has to deal. Tears of the biceps tendon from its insertion in the

radius can be difficult to diagnose and to treat; the muscle will have a reflex atony, whereas other injuries in the front of the joint send it into spasm.

The wrist is another region subject to a great variety of lesions; the mild synovitis after a 'sprain' may be the first sign of synovial tuberculosis. Most adult tuberculous cases have a history of long courses of physiotherapy for sprains and 'lumbago'. If these minor injuries do not yield promptly to efficient massage, then the possibility of bone or joint infection should always be borne in mind. Separation of the lower epiphysis of the radius in children does not always get good reduction, as it also is often labelled 'sprain', but Nature has a kindly way of restoring alignment as the bone grows, which unfortunately she does not use for many weight-bearing lower-limb joints. Fracture of the carpal scaphoid now seems widely recognized in accident services, but many other forms of carpal crack and displacement occur and if not skilfully X-rayed will remain undiagnosed until permanent disability is inevitable.

Fractures of *phalanges* are apt to be treated lightly, whereas they represent serious lesions for the patient and are not easy to treat. The advent of 'perspex', which is light, firm, clean and easily shaped when really hot, should simplify the problems. Böhler of Vienna, whom so many surgeons in this country claim as their master, regarded all digit injuries as major ones, saying it was easier for a man to lose his job from a stiff or deformed finger than from a crooked leg, and he admitted every case for at least one night's in-patient treatment, for the best splinting may not avoid disaster if the circulation fails. This attitude is worthy of being more widely copied in this country. Plaster of Paris, particularly, is apt to involve circulatory disturbance if applied by the semi-expert.

Trigger-thumb follows a common accident in babies in which the end joint is over-forcibly extended and part of the flexor pollicis longus torn; later, a swelling forms on the tendon and will not pass freely down the tendon sheath. The child keeps the end joint at right-angle flexion, which gives very poor function. In most of these cases, if forcibly stretched and held in extension by firm adhesive strapping, the swelling is absorbed and the thumb becomes normal; but the child does not grow out of it. A few cases need open operation to cut the narrow part of the sheath.

SUMMARY

Most of the missed diagnoses are due to failure to examine the case in detail on anatomical lines. The more the possibilities are borne in mind, so that they are excluded one by one, the more accurate will be the diagnosis.

The minor disabilities of the locomotor system are not grown out of and seldom disappear spontaneously, and they are responsible for a vast amount of unnecessary suffering, most of which is seen by the general practitioner and only less frequently by the specialist.

LATE RESULTS OF HELIOCLIMATIC TREATMENT OF TUBERCULOSIS

By M. WASSERFALLEN, M.D., and P. FRANK, M.D.
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Of recent years there has been a tendency to overlook the fundamental conception of tuberculosis as, above all, a general illness, requiring therefore general treatment. Whether or not we accept Ranke's theory, in its entirety or with reservations, we must come to the conclusion that extrapulmonary tuberculosis is in most cases due to a blood-borne dissemination. If a bone focus develops in the months which follow such dissemination, this indicates that the patient has been unable to overcome the infection, and that his resistance and constitution are weakened. If, on the other hand, the focus, which had remained unnoticed and had caused no symptoms, suddenly flares up and becomes active, it is because the general state of the patient's health has changed and his resistance has collapsed. In either case the purpose of any treatment must be primarily to re-establish a normal physiological state, and thus a satisfactory natural defence mechanism, and this can only be achieved by general treatment.

ADVANTAGES OF HELIOTHERAPY

Although the new surgical and antibiotic therapeutic measures enable the immediate and serious danger of a general spread of the infection to be avoided, they do not in most cases ensure a complete cure. This is why, in the present state of knowledge, helioclimatic treatment, as developed by Prof. Rollier, still remains the best way of building up the general health of the patient. Heliotherapy, in the first place, restores to the skin its all-important physiological functions: those concerned with vitamin D, immunity and so forth. But more than that, the exposure of the body to the sun, naturally, without plaster of Paris, re-establishes a normal circulation and reduces muscular atrophy to a minimum. The change of climate stimulates respiratory and digestive function, so that this double action of sun and climate gives the general treatment that is so necessary and desirable. Heliotherapy will also help in building up general defences and, to a large extent, will prevent relapses or the opening up of new foci. Experience shows its real efficacy in the victory of the body over tuberculous infections. It has a beneficial action on the endocrine glands and for some years now the importance of these in connective tissue development and metabolism has been better appreciated.

LOCAL ORTHOPÆDIC MEASURES

With heliotherapy, there must, of course, be combined local orthopædic measures. These will aim at limiting the damage caused by the tuberculous

process, the correction of faulty positions, and safeguarding the patient's future by avoiding the ankylosis of neighbouring joints. Some light and simple apparatus, different, of course, for each joint, will fulfil all these conditions, and in this way it is possible to eliminate entirely the use of plaster of Paris with its many disadvantages: maceration of the skin, serious muscular atrophy, and more or less complete ankylosis of neighbouring joints. All strain must be taken from the affected area, but it is not necessary to resort to absolute immobilization. The best example of this is Pott's disease which is treated in the prone or supine position; absence of strain is secured but immobilization is certainly not absolute, for the patients are able to turn in bed. Nevertheless, pain disappears quickly in the majority of cases. To ensure the immobilization of a joint with plaster of Paris, it is absolutely necessary to fix the neighbouring joints also. This procedure causes a serious loss of function of healthy joints and at the same time further increases the incapacity. It even makes the actual clinical cure almost illusory, since the patient can use the affected limb only with the greatest difficulty. The most striking example of this is tuberculosis of the wrist. With plaster immobilization the fingers also become ankylosed and, especially in adults, will remain so in spite of all physiotherapeutic exercises. When the wrist is healed, the patient will have preserved his hand, but it will be of little use to him.

On the whole, it can be said that the helioclimatic method, combined with rational orthopædic measures, is the most rational treatment of tuberculous infection, and not only a temporary palliative method.

RESULTS OF HELIOTHERAPY

Statistics, however, will show, better than any general consideration, the value of the treatment.

The 'Clinique Manufacture' at Leysin has a bed capacity for 130 adult patients, and we have based our figures upon the results for all the patients admitted during the years 1938 to 1943, which means, with a follow-up period varying from five to ten years, a total of 559 cases. During treatment or shortly afterwards there were 59 deaths, a mortality rate of 10.6 per cent. This was in a particularly unfavourable period with many massive serious infections and complications due to malnutrition and over-fatigue, as many of the patients came from war-devastated Europe. If this period is compared with the present, more normal one, it is found that in the past two years there has been only one death during treatment. In this group 17 died within the first three months of treatment, i.e. 3 per cent. A large proportion (122) of the patients had multiple lesions, and of these 25 died (i.e. 20.5 per cent.), nine (7.3 per cent.) within the first three months. Tuberculosis of the urinary tract also had a high mortality rate: 8 out of 39 (20.5 per cent.).

It is of interest to study in more detail the series of 163 patients, all adults, suffering from Pott's disease. There were 105 with this lesion only, with 12 deaths during or shortly after treatment, i.e. 11.4 per cent., three of

these (2.84 per cent.) after a stay of less than three months. Among the patients with multiple foci, 58 had also a vertebral affection, giving a general total of 163 patients. The total mortality has been 24 patients (14.3 per cent.), of whom 7 had made a stay of less than three months (4.3 per cent.).

These statistics may now be compared with those of Bosworth and Levine of New York (*Journal of Bone and Joint Surgery*, 1949, **31**A, 267). Of 417 cases of Pott's disease, 55.8 per cent. died in the sanatorium (233 patients); 240 were not operated upon, and the mortality in this group was 69.6 per cent. Of 177 patients operated on, 66 died, i.e. 37.3 per cent. If these figures are compared with those that we have found in our series, it is clear that helioclimatic treatment has a considerable beneficial influence, since the mortality among our patients has been only 14.3 per cent. The average length of treatment in the American series was 26.5 months. For our series it was 16.5 months. In other words, our conservative treatment means a considerable economic saving, apart from the relief brought to the patients.

A follow-up of the 559 patients who entered the clinic between 1938 and 1943, has produced information about 460. An analysis of these replies shows that 57.6 per cent. of the patients are working normally, and have never had to consult their doctor about their tuberculosis; in 18 per cent. the results have been incomplete, that is to say they have presented new foci of infection or have needed further treatment, or have had to undergo an operation (7 per cent.); or again, they have been left with sequelæ too serious for them to be able to live a normal life, or they have been prevented from doing so by causes other than tuberculous, such as cardiac troubles, senility (11 per cent.), although remaining completely cured of their tuberculosis. 24.3 per cent. have died (including those who died during treatment), of whom 4.1 per cent. died of non-tuberculous diseases. We can thus say that 68.6 per cent. of the patients have been cured of their tuberculosis, and that 20 per cent. have died.

Of the 143 patients with Pott's disease whose fate we know, we can state that after a period ranging from five to ten years: (i) 51.7 per cent. have gone back to normal life; (ii) in 17.4 per cent. the results have been incomplete; (iii) 30.7 per cent. have died, 4.2 per cent. of them from non-tuberculous causes. Among the patients in group (ii) (those who have been unable to take up a normal occupation), there are 14 who have remained completely cured of their tuberculosis (9.8 per cent.), which carries the percentage of satisfactory results to 61.5 per cent. The other important finding of this follow-up is that the percentage of deaths due to tuberculosis is only 26.5 per cent.

We do not know the climatic conditions of the American sanatorium, nor the exact method of treatment, nevertheless we do know that these are standard, and that the patients receive all the care that their condition requires. We must then ascribe the better results shown by our statistics to the climatic conditions and to heliotherapy, and we are brought back to our original thesis that tuberculosis is a general disease which requires general treatment.

THE DOCTOR AND THE CLEVELAND HEALTH MUSEUM

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Director, Cleveland Health Museum.

One of the underlying goals of Cleveland Health Museum's many and varied activities is perfect understanding and faith between doctors and their patients. For this reason, museum exhibits go beyond biology into personal health, with special emphasis on the 'positive' rather than on the 'negative' side of living.

The original meaning of the word doctor—'teacher'—indicates that medical men have always been health educators. Patient education by 'M.D.s', however, has not always proved satisfactory. There are a number of reasons. Often the doctor is so rushed, he has time only for brief, sketchy replies. There is little privacy for the patients in hospitals when the doctor comes into a room surrounded by a resident, an intern, a floor nurse, and perhaps a private nurse. At other times, his answers are given in such learned or technical terms, that the patient finds it difficult to comprehend the meaning of what is being said. Then, again, there are medical men who feel the public is already subjected to too much 'health education', and that the less information given a patient, the less risk there is of that person becoming a 'hypochondriac'.

Concerning the dangers of self-diagnosis, the fact has always been that the primary diagnostician in any illness is the sufferer himself. If a patient is not aware of an abnormality, he will not take the first step, which is to seek proper treatment. People born with certain tendencies will become hypochondriacs with or without health education. In fact, a doctor by concealing facts can often increase such a tendency. Honest health education, on the other hand, relieves anxieties and encourages a more optimistic outlook.

SOME ACTIVITIES OF THE MUSEUM

All this points inevitably to the need for continued, authentic health education to counterbalance the unceasing commercial activity on behalf of the too many pills, powders, and purges that are sold so glibly to the unsuspecting public. A step in this direction was taken ten years ago when Cleveland Health Museum (fig. 1) became a reality through the efforts of a few far-sighted, pioneer-spirited, health-conscious men and women. America's first health museum has been from the start an independent organization incorporated not for profit but 'to educate the public in matters of health'. It originated from recommendations of the Health Education Committee of the local County Medical Society.

Public interest and acceptance by national and international health educators came so quickly as to surprise even the most enthusiastic supporters of the Museum. The main offer of the Museum has been education of the public by unique, three-dimensional exhibits. In ten years nearly half a million people have passed through its doors.

The Museum has acted as host or has provided meeting rooms for countless organizations, both professional and lay. These have included expectant mothers, expectant fathers, doctors, nurses, students, pharmacists, dietitians, and teachers. Classes, medical scientific meetings, and health activities of many kinds are the order of each day. Among others, the Museum has shown

FIG. 1.—Exterior view of Cleveland Health Museum.

exhibits sponsored by, and especially built for, the Anti-Tuberculosis League, National Foundation for Infantile Paralysis, Cancer Society, Heart Society, Mental Hygiene Association, Association of the Hard of Hearing, and Cleveland Allergy Society—thus making the Museum a true community health education centre.

Cleveland Health Museum differs from other museums in that there are no 'hands off' signs and the halls are seldom quiet. As visitors pass exhibits there is always a low murmur of interested comments. Young children are among the most welcome guests. Whole families come to visit on Sunday afternoons or Wednesday evenings. The museum is open every day and admission is always free.

It is conservatively estimated that for every person viewing the exhibits

housed in the Museum, ten more are reached through the Museum's extensive services—exhibits at county fairs, radio broadcasts, community projects, state conventions, school programmes and lectures. Museum activities within the community are also numerous. Each year during August and September, a daily 'pollen count' is furnished by the Museum and widely published in newspapers and by radio. This is done because at least 10 per cent. of the American public suffer allergic reactions to 'ragweed pollen', which is prevalent at this time of year. The Museum has also instigated the demand that more be done about Cleveland's air pollution. Cancer institutes for professional and lay persons are held periodically. Recently, a series of diabetes detection clinics was held with an eye to discovering Cleveland's unknown diabetics. Requests for loans such as exhibits, films and slides, come from far and near. Calls for Museum services increase week by week.

HEALTH EDUCATION

There is no denying that public interest in health exists. All that is needed is to satisfy that curiosity with the truth. Every new discovery in treatment, diagnosis, or technique has increased the demand for more and better medical service.

In America more than in any other country of the world, voluntary health agencies are promoting public health education on a scientific basis. $150,000 are contributed annually by the general public for health promotion purposes, the majority in one dollar bills. The Cleveland Health Museum derives its income from its more than 1,700 members, two-thirds of whom are lay people, from an endowment, and from the 'earnings' of its workshop activities, by making exhibits available to other institutions and museums in the United States and abroad.

The function of the Cleveland Health Museum is to tell the truth. It is not an advertising agency for the medical, or any other, profession. At the same time, there is no doubt that merely by pointing out the truth, it does for the medical profession the same thing done by the insurance companies advertising on behalf of accident prevention.

A health museum not only brings 'Health through Knowledge' but lessens anxiety. It is logical to worry when faced with serious illness, yet fear of the 'unknown' oftentimes increases nervous tensions. Exhibits that give simple, yet clear, explanations of diseases—their causes and means of cure—act as sedatives.

THE EXHIBITS

The exhibits displayed by Cleveland Health Museum come from various sources. Many of them have been manufactured in its own workshops. When the 1939-45 war broke out, many exhibits of the American Museum of Health, heir to the New York World's Fair—Hall of Man, were sent to

Cleveland on loan. Important exhibits have also come on loan from the American Medical Association, American Dental Association, the Mayo Clinic, and the Cranbrook Institute of Science.

FIG. 2.—Workshops—these health education laboratories of the Museum not only turn out exhibits for the Museum, local, national and international organizations, but also play an important part in the visual aid training of health education interns.

The Museum has from the beginning had an active programme in its own workshops carried on by staff artists and technicians (fig. 2). Besides making a large amount of material for display in the Museum, duplicates of exhibits are made for others. Special exhibits have been ordered by the governments of Mexico, Colombia, New Zealand, and Canada. A research programme planned to develop plastic anatomical models for teaching purposes is at present being pursued under the direction of, and in cooperation with, the United States Veterans' Administration.

Visitors are attracted by the variety of shapes, sizes and colours found in exhibits. By deliberate use of artistry, mechanical movement, three-dimensional effect, and appeal to the play instinct, Cleveland Health Museum makes the unseen visible and interesting. Many exhibits are constructed so that the visitor must 'make them work' himself. Blood circulation is shown by the red light which travels the blood cell's circuit when a switch is flicked on. A lever works the artificial lungs; a replica of the heart thumps out 72 beats a minute, as a red light flashes each beat; the posture lady is pushed into an ideal stance.

In the *Wonder of New Life* room the stages of birth, the growth of the

embryo within the mother, the female and male organs are depicted by the life-size Dickinson-Belskie 'Birth Series' models. Selected copies of these models were first shown in 1949 at the Health Education Conference in London, sponsored by the National Council for Health Education, and are now on display at the Royal College of Midwives in London. From these models adolescents learn the story of birth, and expectant mothers learn how to prepare for their young. Prenatal classes for both expectant mothers and fathers are held regularly each week. Cleveland Health Museum holds exclusive duplication rights on these Dickinson models (fig. 3).

The Museum's newest acquisition is a *Talking Transparent Woman*, recently christened 'Juno', and shown in the summer of 1950 at the British Food Fair under the name 'Lumena'. Scientifically correct, her plastic skin reveals the bones, main organs, arteries, veins, nerves, and lymphatic system in the same positions and colour as found in the human body. She stands on a revolving turn-table. As the inner organs light in sequence, Juno 'talks' about them for her audience.

Other typical Museum exhibits include: *Body Chemistry*—the chemical elements of the human body (carbon, sulphur, magnesium) are shown in amounts found in the average man; *Living Tools*—dental exhibits explaining

FIG. 3.—Birth Series models in the 'Wonder of New Life' room.

structure as well as proper care of the teeth; *Your Life Span*—when a visitor dials his age, he learns the number of years he can reasonably expect to live (figures derived from actuarial statistics of life insurance companies);

Calorie Automat—a unique device showing the number of calories contained in average servings of everyday foods; *Races of Mankind*—scientific facts on the origin and history of races and nationalities within mankind; *Coughing Man*—excellent presentation of manner in which germs are spread by unguarded coughs and sneezes; *Food Facts and Fallacies*—debunks popular superstitions about foods; '*How's Your Hearing*?'—visitors may take a test and find out; *See-Hear-Your Heartbeat*—visitors enjoy listening to their heartbeats as this action is visually recorded for them.

The Health Museum is exchanging material with similar institutions in Great Britain, such as the Royal Sanitary Institute, and the Wellcome Museum. Dr. D. A. Allan, Director of the Royal Scottish Museum, Edinburgh, has suggested that a British Health Museum might advantageously be located in connexion with the new activities in Nottingham.

OTHER ACTIVITIES

Today the Health Museum exerts an important influence outside its own walls through loan exhibits which reach not less than ten times the number of persons who visit. Displays have been offered by the Museum at numerous public exhibitions. Trustees and staff members often participate in community affairs as chairmen, moderators, discussants or speakers on various programmes. The Museum's regular Sunday newspaper column and radio broadcasts reach an uncounted audience.

In November of each year, the Museum offers the Prentiss National Award in Health Education 'to encourage through recognition outstanding public service in the health education field'. Recipients are selected by the Museum's National Advisory Council which is composed of leaders in health education from all parts of America. The award also honours the memory of the Museum's first foundation benefactress—Elisabeth Severance Prentiss.

The strength of Cleveland Health Museum, or any other educational institution, is not a matter of size or number of floors. We become increasingly stronger as we become a greater living force in community life.

CURRENT THERAPEUTICS

XLV.—TERRAMYCIN

By CHESTER S. KEEFER, M.D., F.A.C.P.

Director, Robert Dawson Evans Memorial; Physician-in-chief, Massachusetts Memorial Hospitals; Wade Professor of Medicine, Boston University School of Medicine.

TERRAMYCIN hydrochloride is one of the more recently discovered antibiotics that has been tested clinically during the past eighteen months. It was isolated by the members of the Research Group of Charles Pfizer & Co., Brooklyn, New York, after screening many thousands of soil samples collected from all parts of the world. The micro-organism from which the antibiotic is elaborated is *Streptomyces rimosus*. The antibiotic is very stable, and in the dry state it shows no detectable loss in activity on prolonged storage at 25° C.

Terramycin is rapidly absorbed from the gastro-intestinal tract and produces significant, continuous blood plasma concentrations with dosages as low as 0.25 g. every six hours. Excretion of terramycin in active form occurs readily in the urine, and at a more rapid rate than either aureomycin or chloramphenicol when these two drugs are given in comparable doses. Also, relatively large amounts are excreted in the stools. Following absorption from the gastro-intestinal tract the antibiotic can be found in many organs of the body, including the skin, liver, spinal and pleural fluid, kidney, lungs, spleen and in the bile. From a study of the plasma concentration of terramycin following oral administration it would appear that optimum concentrations occur within six hours, so it would seem desirable to divide the daily dose into four equal parts.

DOSAGE FORMS

The most commonly used dosage form of terramycin is the capsule of crystalline terramycin hydrochloride. They are dispensed in 50, 100, and 250 mg. capsules. Other available preparations include crystalline terramycin hydrochloride—elixir, oral drops, ophthalmic solution, ophthalmic ointment, topical ointment, troches, and vials containing 0.25 or 0.5 g. for intravenous use.

The capsules are used most widely, since they are convenient and the absorption from the gastro-intestinal tract is rapid. Intravenous injection of terramycin should be reserved for those patients who are extremely ill, and who are unable to take the agent by mouth. The solutions of terramycin have been properly buffered and in no circumstances should aqueous unbuffered solutions be used for any purpose. The acid reaction of terramycin, pH 2.5, is responsible for its irritating effects when used locally without buffering.

BACTERIAL SPECTRUM

Hobby and her associates have demonstrated that terramycin is active both *in vitro* and *in vivo* against a wide variety of pathogenic organisms belonging to the bacterial, spirochætal and rickettsial groups, certain of the large viruses, and against *E. histolytica*. Terramycin acts promptly upon sensitive cells and exerts a *bactericidal* effect when the ratio of the concentration of the antibiotic to the initial number of organisms is high. When this ratio diminishes, the bactericidal effect diminishes and a bacteriostatic action only may be shown. Hobby has pointed out an additional important fact, namely, that under conditions suitable for bacteriostasis, there is a prolonged lag period during which no antimicrobial action is apparent. Such studies suggest that when terramycin is used the concentration of the drug in the tissues should be sufficiently high, so that bactericidal effects are produced.

In general, it can be said that terramycin is active against a wide variety of aerobic and anaerobic micro-organisms of the gram-positive and gram-negative groups. *Proteus vulgaris* is completely resistant. Gram-positive cocci are more sensitive to terramycin than gram-negative bacilli. In this respect, the agent resembles aureomycin and penicillin. A list of sensitive organisms is contained in table 1.

TABLE 1

Beneficial effect	Partial effect	No effect
Pneumococcal pneumonia	Friedländer bacillus infections	*B. proteus* infections
Staphylococcal infections	Syphilis	Typhoid fever
Hæmolytic streptococcal pneumonia	Actinomycosis	*Ps. aeruginosa* infections
Primary atypical pneumonia	Anthrax	Salmonella infections
Rickettsial diseases	Tularæmia	Ulcerative colitis
Amœbiasis	Reiter's disease	Pemphigus
Brucellosis	Peritonitis due to mixed bacterial flora	Malaria
Bacteroides infections		Trichinosis
Yaws		*H. influenzæ* meningitis
Gonorrhœa		Mumps
Lymphogranuloma venereum		Measles
Granuloma inguinale		Varicella
Urinary tract infections due to susceptible organisms		Variola
		Herpes simplex
		Herpes zoster
		Epidemic influenza virus

CONDITIONS IN WHICH TERRAMYCIN HAS PROVED OF VALUE

From the initial studies of terramycin concerning its action against microbes it was soon designated as an antibiotic with a broad bacterial spectrum, suggesting that it was an effective agent against many different species of micro-organisms—gram-positive and gram-negative organisms, spirochætal and rickettsial infections, *Endamœba histolytica* infections, and

lymphogranuloma venereum, as well as granuloma inguinale, and primary atypical pneumonia.

Experience has accumulated to indicate that terramycin is an active and suitable agent in the treatment of a number of infections. I have made a list of three groups of infections as follows: (1) diseases in which terramycin has been effective; (2) diseases in which its effect has been partial; and (3) diseases in which terramycin is ineffective. I shall focus attention now on group 1.

Pneumococcal pneumonia.—Everyone agrees that terramycin is an effective agent in the treatment of pneumococcal pneumonia. The patients respond in a favourable manner and the fatality rate is decreased. The response in patients with bacteriæmia is slower than in the non-bacteriæmic cases and, according to some, the period of recovery is slower and the incidence of complications higher than in patients who are treated with penicillin or aureomycin. The recommended dosage has been 0.5 to 1.0 g. every four hours. The common dosage is 0.5 g. every four hours. Other reports have shown that the response of patients to terramycin is comparable to that observed with penicillin.

Primary atypical pneumonia.—This form of non-bacterial pneumonia responds favourably and promptly to terramycin, and the results are comparable with those following the use of either aureomycin or chloramphenicol —2 g. a day for six to seven days is usually adequate. Within a few hours after treatment is started, Kneeland and Melcher report a lessening in the intensity of the symptoms. The temperature decreases within the first twenty-four hours and commonly reaches normal levels within forty-eight hours. Convalescence is uneventful, and rapid clearing of the pneumonitis is observed.

Pneumonia due to mixed bacterial infections.—Obviously, this is a difficult group of cases to assess, but slow progressive improvement has been observed following treatment. The same may be said for a wide variety of undifferentiated upper respiratory infections with a mixed bacterial flora. Following terramycin the bacterial flora changes and there is often a prompt improvement in symptoms.

Hæmolytic streptococcal infections, such as erysipelas, tonsillitis and pneumonia, improve promptly following treatment.

Staphylococcal infections.—There is an increasing number of strains of staphylococci that are resistant to reasonable concentrations of penicillin. Some of these strains are sensitive to terramycin. In such instances terramycin should be used. Finland and his associates have found a number of strains of staphylococci, derived from patients who had not received terramycin, which were more resistant to terramycin than to aureomycin. In addition, the same group report that staphylococci often appear in the sputum of patients who are being treated with terramycin for pneumococcal pneumonia, and in urinary tract infections coliform organisms were re-

placed in some instances by staphylococci. The occurrence of terramycin-resistant strains of staphylococci, and the appearance of staphylococci in the sputum or in the urine of patients who are being treated with terramycin, should be noted and their significance properly assessed, because the results of terramycin treatment of patients with staphylococcal infections have been favourable. Treatment failures have been reported in urinary tract infections and in bacterial endocarditis, but staphylococcal infections in these locations have also responded in a striking manner. There is thus no doubt that the clinical results of terramycin treatment in staphylococcal infections have been favourable.

Brucellosis.—This relapsing disease can be influenced favourably by terramycin when it is administered continuously for a period of two weeks or longer. It is superior to the combined treatment with streptomycin and sulphadiazine. It may shorten the illness and decrease the relapses, although it will not eliminate them.

Rickettsial diseases.—Epidemic, murine and scrub typhus, Rocky Mountain spotted fever and rickettsial pox, all caused by different strains of rickettsiæ, are controlled with terramycin. Thus, there are three agents available for the effective treatment of these diseases—aureomycin, chloramphenicol and terramycin.

Positive effects have been recorded in patients with gonorrhœa, yaws, lymphogranuloma venereum, urinary tract infections due to susceptible organisms, and *Bacteroides* infections.

OTHER CONDITIONS IN WHICH TERRAMYCIN HAS BEEN USED

I now wish to discuss a group of infections in which terramycin has been used and in which the therapeutic results have been suggestive of a positive or partial effect.

Pneumococcal infections of the *meninges* and *peritoneum* have responded favourably to treatment in a few cases. Due to the severity of pneumococcal infections in these two locations it is well to explore the use of terramycin further when the occasion arises.

Friedländer bacillus pneumonia has been improved in about half of the cases. This infection is seen not infrequently in patients with chronic illness, such as diabetes mellitus or chronic alcoholism. It often runs a rapid and fulminating course, but in the less acute cases the process is likely to lead to necrosis of the lung with abscess and cavity formation. It is for these reasons that Friedländer bacillus pneumonia should be recognized promptly and therapy started at once.

Actinomycosis, anthrax, peritonitis, tularæmia, Reiter's disease, and pertussis have all been treated in a few cases. The results suggest that terramycin is another useful agent in the management of these infections and its possibilities should be explored further.

The action of terramycin in *syphilis* is positive, since treponemas disappear from lesions within twenty-four to forty-eight hours. No statement can be made concerning long-range results.

There is general agreement that terramycin is ineffective in *B. proteus* and *Ps. aeruginosa* infections and infections due to the typhoid bacillus, and Salmonella infections, such as gastro-enteritis or localized infection in other areas. Therapeutic failures are reported in regional ileitis, ulcerative colitis, pemphigus, malaria, trichinosis, and *H. influenzæ* meningitis. Also, the therapeutic results have been negative in mumps, measles, chickenpox, smallpox, herpes simplex, lymphocytic chorio-meningitis, herpes zoster, and epidemic influenza virus infections.

SIDE-REACTIONS

There are several symptoms and signs suggesting toxic side-reactions. The three common ones are nausea, vomiting, and diarrhœa. Other less frequent symptoms and signs are stomatitis, a skin eruption or epigastric pain. The most disturbing side-effects are the gastro-intestinal symptoms. In a few patients the symptoms are so severe that it is necessary to discontinue the drug. In others they are of a mild nature and the drug can be continued. In a few cases, a new infection due to monilia may appear in the mouth, throat, intestinal tract and vagina. The only control for such new infections at present is to discontinue the antibiotic.

CONCLUSION

From this discussion it can be said that terramycin is an antibiotic that has taken its place along with other anti-infective agents for the treatment of a wide variety of infections. In a broad sense, it has the same bacterial spectrum as aureomycin and penicillin on the one hand, and chloramphenicol and streptomycin on the other. It should be added that the diseases in which penicillin has no effect, and in which terramycin and aureomycin are effective, include gram-negative bacillary infections, rickettsial diseases, primary atypical pneumonia, brucellosis, lymphogranuloma venereum, and granuloma inguinale.

REVISION CORNER

HICCOUGHING

(HICCUP OR SINGULTUS)

'Mme. de Durfort se meurt d'un hoquet d'une fièvre maligne'.
Lettres de Mme. de Sévigné.

HICCOUGH is seldom a presenting symptom of disease but, as the above quotation from the 17th century shows, it has long been recognized as a terminal event of serious significance. More rarely, however, it may occur alone and cause great distress and exhaustion.

ANATOMY AND PHYSIOLOGY

A large proportion of cases of hiccough are due to peripheral stimulation of the vagus or phrenic nerves. The cases of central origin probably represent a myoclonus of the diaphragm, and may rarely show an associated myoclonus of other parts of the body, such as the soft palate and glottis. It has been suggested that this may be due to liberation of the olives in the medulla from the control of adjacent centres, the hypothalamic nuclei and mammillary bodies. A similar physiological release phenomenon may be involved in the common hiccough following excessive laughter, for to become 'weak with laughter' seems comparable to the phenomenon of cataplexy, which is often precipitated by laughter. In the same way pathological spontaneous laughter, which probably results from the release of the thalamus and other lower centres from cortical control, may be compared with the conviviality obtained by the social use of alcohol to remove cortical inhibitions.

CAUSES OF HICCOUGH

In Health

Hiccough may be caused by overdistension of the stomach, both in the unweaned baby, who hiccoughs with a look of mild surprise after too large or too rapid a feed, and also in the gourmand, who distends his stomach with too large a meal or irritates it with too highly seasoned dishes.

Apart from its effect in producing hiccough from immoderate laughter, alcohol must be considered also in relation to its peripheral irritant effect on the stomach and its central action on the nervous system. Indeed, alcoholic excess is so generally associated with hiccough that the professional comedian on his entry on to the stage has only to hiccough to inform his audience that he is portraying a drunk.

In Disease

(1) *Afferent side of the reflex.*—This is stimulated by distension of the stomach, caused by intestinal obstruction and other diseases of the alimentary tract, although in cases of meteorism due to peritonitis and severe typhoid fever the toxæmia may also produce hiccough by irritation or 'release' of the medullary centres. In such cases hiccough is often a terminal event.

(2) *Medullary or central part of the reflex.*—The most common toxæmic cause of hiccough is uræmia due to such conditions as chronic nephritis and surgical disorders of the urinary tract, or of extra-renal origin, such as severe vomiting. Severe hepatic insufficiency from cirrhosis of the liver may also cause toxæmic hiccough.

Epidemic hiccough, occurring with epidemics of encephalitis lethargica, is generally regarded as being due to the same virus. Most of the cases have shown a minimum of generalized signs and only slight fever. The bouts of hiccough lasted three-quarters to one hour at a time with periods of two to three hours' intermission, and in some cases persisted at night. Recovery in a few days was usual, but, as the review of groups of patients over a number of years is a comparatively recent practice, it seems uncertain whether any proportion of these cases developed a chronic Parkinsonism later. In the absence of an epidemic such cases may be indistinguishable from 'idiopathic' and hysterical hiccough.

As suggested in the note on anatomy and physiology, other central lesions, such as posterior fossa cerebral tumours, other forms of encephalitis such as polioencephalitis, and some cases of meningitis, can cause hiccough.

(3) *Efferent part of the reflex.*—Lesions in the upper cervical cord may involve the anterior horn cells of the 3rd, 4th and 5th cervical roots. For example, Pierre-Kahn, Barbier and Bertrand (*Bull. Soc. méd. Hôp. Paris*, 1921, **45**, 787) described the case of a fifty-two year old woman, who presented a paresis of the right arm and died with spasms of hiccough excited by even the sight of a glass of water. The lesions found by them at necropsy appear to have been due either to an acute encephalitis lethargica or to a bulbo-cervical poliomyelitis.

The phrenic nerves may also be irritated in the neck, during their course in the mediastinum, and at their termination in the diaphragm. Such irritation may be due to mediastinal tumours, aortic aneurysm, thoracic wounds, pericarditis, mediastinal and diaphragmatic pleurisy, and subphrenic abscess.

(4) *Unexplained cases.*—The cases that cause most difficulty are those which present with hiccough as their only symptom. The treatment of most of the conditions already mentioned is primarily that of some grave underlying disease, or else the hiccough only appears as an additional adverse prognostic sign towards the end of a fatal illness. Some unexplained cases, as already suggested, may be sporadic examples of epidemic hiccough, whilst others may be due to small arteriosclerotic lesions of the medulla. Most, however, are probably a simple reflex hiccough from gastric irritation, which has become perpetuated by emotion. A few may be cases of conversion hysteria, when the hiccough is more of a crowing noise and usually ceases during sleep. The presence of an emotional factor is confirmed by the fact that an emotional shock or attempt at concentration may abort an attack. Thus a master cured the schoolboy who annoyed him by a persistent hiccough, by offering him a sovereign to do it again.

TREATMENT OF HICCOUGH

The lack of a specific remedy is shown by the large number of treatments recommended and the diversity of opinions on their value, for instance on the use of morphine. The simpler measures employed are:—

(1) A stimulus to inhibit the reflex, e.g., a sudden fright; pressure on the eyeballs; pressure on the carotid sinus; taking a very hot bath; rhythmic tongue traction for one to two minutes at a time; pulling up the knees; pressure on, or electrical stimulation of, the phrenic nerves in the neck; ice packs to the sides of the neck; abdominal or thoracic pressure at the points of insertion of the diaphragm; retching induced by tickling of the throat; inhalation of smelling salts; sneezing induced by pepper or snuff.

(2) Cerebral concentration, e.g., drinking a glass of water from the wrong side.

(3) Stimulation of the respiratory centre by carbon dioxide—by holding the breath as long as possible; by rebreathing in and out of a large paper bag; by inhalation of 7 per cent. carbon dioxide in oxygen.

(4) Stimulation of the stomach. A dose of Seidlitz powder; a small dose of neat spirits; a teaspoonful of salt and lemon juice; 1 minim (0.06 ml.) of oil of peppermint or of cajuput on a lump of sugar.

(5) Relief of gastric irritation or gastric distension—gastric lavage for gastritis; continuous gastric aspiration in postoperative cases.

Among the numerous medicinal treatments are the following:—

Sedative drugs:—

(a) By mouth: Bromide, 20 to 30 grains (1.3 to 2 g.).
Chloral hydrate, 20 grains (1.3 g.).
Chlorbutol (chloretone), 15 grains (1 g.).
Nembutal, 1½ to 3 grains (0.1 to 0.2 g.).
Sodium amytal, 3 to 6 grains (0.2 to 0.4 g.).

(b) By subcutaneous injection: Phenobarbitone sodium, 2 grains (0.13 g.).
Morphine, ¼ grain (16 mg.).
Apomorphine HCl, ⅛ grain (8 mg.).
Cocaine HCl, ⅛ grain (8 mg.).

Anæstheticss:—

(a) By inhalation: Ether.
Chloroform.

(b) Intravenously: Pentothal.

Antispasmodic:—

(a) By mouth: Benzyl benzoate ('spasmodin'), 20 to 40 drops of 20 per cent. alcoholic solution in water or milk, four-hourly.
Nitroglycerin tablets (Tab. trinitrini), 1/100 grain (0.65 mg.), sublingually, twice or thrice daily.

(b) By subcutaneous injection: Atropine sulphate, 1/100 to 1/50 grain (0.65 to 1.3 mg.).
Pethidine HCl, 50 mg.

Medicinal treatments:—

Inhalation of amyl nitrite, standard 3 minim (0.18 ml.) glass capsules (Nairn: *Lancet*, 1947, **i**, 829).

Hexamethonium bromide ('vegolysin'), 2 tablets of 0.25 g. each, followed once four hours later by 3 tablets of 0.25 g. each (McGill: *Lancet*, 1951, **i**, 1018).

Hyoscine hydrobromide, 1/200 grain (0.32 mg.) tablet, sublingually, repeated once if necessary after half an hour (Laycock: *Lancet*, 1951, **i**, 1179).

Finally, if all other remedies fail and there is grave exhaustion, it may be justifiable to induce a temporary paralysis of the phrenic nerves by the injection of procaine two fingers' breadth above the clavicle at the anterior border of the sternomastoid at a depth of 2 to 4 cm., allowing a day's interval between the injection of the two sides.

That the simpler remedies have long been known is shown by the following quotation from Jowett's translation of 'The Symposium' of Plato, where the different members of the dinner party, who incidentally had agreed for that evening not to drink too much, come to take their turns in the discourse:—

. . . the turn of Aristophanes was next, but either he had eaten too much, or from some

other cause he had the hiccough, and was obliged to change turns with Eryximachus the Physician—

"Eryximachus, [he said], you ought either to stop my hiccough, or to speak in my turn until I have left off". "I will do both, [said Eryximachus], I will speak in your turn and do you speak in mine; and while I am speaking let me recommend you to hold your breath, and if after you have done so for some time the hiccough is no better then gargle with a little water; and if it still continues, tickle your nose with something and sneeze; and if you sneeze once or twice, even the most violent hiccough is sure to go". At the end of the Physician's discourse Aristophanes says, "Yes, the hiccough is gone; not however until I applied the sneezing" . . . '

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AEROPHAGY

SOME degree of aerophagy is inevitable in the ordinary commerce of the table. The first degree of abnormality is reached when the amount of air swallowed obtrudes itself on the notice of the swallower, the second when this awareness is communicated to bystanders by a series of noisy eructations. Even this second degree of abnormality passes muster in Eastern countries as the current coin for appreciation of a good meal; but in civilizations lacking this convention, aerophagy of either degree is a complaint in the medical sense.

CAUSAL FACTORS

The swallowing of air which provides munition for the subsequent belch may not be obvious either to the patient himself or to the uninstructed bystander, so the patient's complaint is of frequent noisy and apparently uncontrollable eructation. By the time he comes to the physician, air-swallowing has become an inveterate, if unrecognized, habit; but its origins can sometimes be traced to predisposing factors, such as excessive salivation, or upper abdominal discomfort. As causes of excessive formation of saliva, which is swallowed with air, Abrahams (1950) mentions dental irritation, oral or pharyngeal inflammation, œsophageal disease, excessive use of tobacco, and reflex salivation in hyperchlorhydria or early pregnancy. It is doubtful if excessive salivation is a frequent cause of flagrant belching. The practice of aerophagy may also owe its origin to the attempt to relieve upper abdominal discomfort by 'bringing up wind', a process which is naturally facilitated by first getting some wind down. In this context, belching may be associated with anginal pain, or with gall-bladder disease, but most commonly with upper abdominal discomfort for which no organic cause can be found. A rare syndrome is that known variously as the cascade, cup and spill, or champagne-glass stomach, in which loculation seems to favour accumulation of an excessive amount of air in the stomach, with a feeling of distension which may initiate the habit of air-swallowing. Gastric fermentation is negligible as a cause of belching, as it occurs only when achlorhydria and gastric stasis are combined; these are absent in almost all patients who belch obtrusively. In infancy, the swallowing of air with milk is a clearly recognizable cause of discomfort after feeds.

In whatever way the practice of air-swallowing is begun, its perpetuation and aggravation clearly owe much to a neurotic habit formation. Air-swallowing can often be seen in nervous people who do not show the subsequent belching of the less inhibited. Before seeing a doctor, the patient may tune up his belching to concert

pitch, not without appreciation of its effect on those waiting with him. Belching is often one of several dyspeptic symptoms, with lack of periodicity or relation to food, suggesting that they are not related to organic disease. By contrast, habitual and obvious belching is not common in organic dyspepsia; Bockus (1944) even says that in his experience 'excessive belching is not common in gall-bladder disease in the absence of an associated neurosis'.

Aerophagy may be associated with abdominal distension, but not necessarily so. Noisy belching can be produced by air from the lower œsophagus, and no excessive quantity of air be demonstrable in the stomach. In other patients, much of the swallowed air does enter the stomach, and in sufficient quantity to cause bloating. This should be differentiated from the syndrome of hysterical abdominal proptosis (Roussak, 1951), in which there is no excess of air in the abdomen, and the swelling is attributed to lowering of the diaphragm.

DIAGNOSIS AND TREATMENT

The diagnosis of aerophagy as a cause of belching presents little difficulty, as the swallowing of air is visible when looked for. Very obvious belching may arouse the presupposition that the dyspepsia is functional, but in the patient's interest organic disease has to be excluded. When the history is a tissue of neurotic complaints, and examination shows nothing beyond swallowing and perhaps some bloating, the patient should be told that there is no evidence of organic disease. Some patients will accept such reassurance; others, partly sophisticated, will be unhappy until they have had a barium meal. The association of aerophagy with periodic pain, or with loss of appetite or weight, makes a barium meal obligatory.

In the absence of organic disease, the patient should be told that his belching is caused by swallowing air, and that he can cure himself of the habit if he wishes. Air cannot be swallowed when the mouth is open, but this does not prevent the eructation of previously swallowed air. The patient should therefore be told to keep his mouth a little open when he has abdominal discomfort; the will in this matter may be reinforced by holding a cork between the teeth. It has to be recognized that some patients with aerophagy do not really wish to be cured, and that their wishes are likely to prevail over those of the doctor.

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NOTES AND QUERIES

Diphtheria Immunization and Familial Asthma

QUERY.—A teacher and his family (children aged eight, three, two, and nine months) moved recently from Birmingham to this district. When I asked whether the baby had been inoculated for diphtheria I was told that none of the children had had diphtheria immunization for the following reason: One child was vaccinated in 1941, at the age of two months, and developed bronchial asthma, and died from it at the age of five months. The child's father suffered from asthma up to the age of fourteen, and the paternal grandfather suffered from eczema periodically. The parents were advised

in Birmingham to have none of their children vaccinated or immunized before the age of seven. Asked whether I agreed, I told the parents that I considered it risky not to have the children immunized for diphtheria, but on account of the family history I would immunize the children only after having obtained an expert opinion as to the best way to minimize any awkward reaction due to the immunization. I should be grateful for any advice you could give me in dealing with this problem.

REPLY.—I think that the best advice that can be given is that contained in Dr. H. J. Parish's book on 'Bacterial and Virus Diseases' (page 83). He points out that it is desirable to avoid the necessity of having to give diphtheria antitoxin for therapeutic purposes, and if any of the children referred to by your correspondent have the misfortune to develop diphtheria they would have to have antitoxin. The method suggested by Dr. Parish is to give a small 'detector dose' of A.P.T., i.e., 0.1 ml. If there is no reaction after this, two subsequent doses of 0.5 ml. should be given with an interval of four weeks between them. If there is a reaction it would be better to try to immunize with a series of small doses of 0.1 or 0.3 ml., the exact dosage depending upon the amount of reaction produced.

ARTHUR GALE, D.M.

Streptomycin in Tuberculous Meningitis

QUERY.—A near relative of mine, a child aged four-and-a-half years, is suffering from tuberculous meningitis with a small focus in the hilum of the right lung. I would like to know the latest treatment, especially with reference to intrathecal streptomycin.

REPLY.—Streptomycin still remains the only really effective remedy for tuberculous meningitis. Promizole and *para*-aminosalicylic acid (P.A.S.) have been employed in conjunction with streptomycin but it has been extremely difficult to assess with certainty any improvement in the results by their combined use.

Streptomycin must be given by intramuscular injection not less than twice daily, using a dosage of approximately 0.02 g. per pound of body weight per day, in children. Intramuscular treatment must continue for at least six months. Nine or twelve months is usually required. Intrathecal streptomycin is absolutely essential and must be continued for not less than 60 days, and some Units, such as the Radcliffe Infirmary, Oxford (Sir Hugh Cairns), continue intrathecal treatment for six months or longer. It is dangerous to cut short the intrathecal treatment or interrupt it for more than a few days, in spite of excellent clinical progress. Skilled nursing, physiotherapy and skilled lumbar puncture are important additional factors affecting the outlook.

The latest advance in treatment, or rather, experimental work suggesting possible further advances, is that of Honor Smith (*Lancet*, 1950, **ii**, 295), using tuberculin intrathecally, but she emphasizes that the treatment is not only extremely difficult but can be highly dangerous. In conclusion therefore I would say that the treatment of tuberculous meningitis still consists in prolonged intrathecal treatment with streptomycin, and prolonged intramuscular cover beyond the period of intrathecal treatment. There appears to be no short cut.

DERMOD MACCARTHY, M.D., M.R.C.P., D.C.H.

Chloramphenicol and Typhoid Immunity

QUERY.—Do typhoid patients acquire immunity to the disease after being cured by chloramphenicol?

REPLY. — Theoretically, if chloramphenicol treatment were started at the time of invasion with the typhoid bacillus the formation of immune bodies might be prevented, as happens in the laboratory when an appropriate antibiotic is administered simultaneously with an experimental infection. In practice, however, typhoid is not diagnosed or suspected until the infection has become established, and serological studies in cases of typhoid treated with chloramphenicol have shown that the Widal titre increases progressively during the period of treatment and in early convalescence. It is not certain whether or not the development of immunity is slower than in untreated cases. High relapse rates have been reported following chloramphenicol, but fortunately there is no indication that the organisms become resistant to the drug and relapses respond readily to further treatment.

W. H. HARGREAVES, O.B.E., F.R.C.P.
LT.-COLONEL, R.A.M.C.

Recurrent Retinal Hæmorrhages

QUERY.—A British male domiciled in India, aged forty years, has been suffering from recurrent retinal hæmorrhages for the last eighteen months. Hæmorrhages occur suddenly at varying intervals in one or the other eye. Ophthalmoscopic examination reveals no abnormality except patches of hæmorrhage. With the passage of time they become absorbed and full vision returns until the next attack. Fortunately, up to now, the disc has escaped every time. There is an indefinite history of gonorrhœa about ten years ago, but gonococci have never been found in the prostatic secretion. The Wassermann and

Kahn reactions, examination of stool and urine, and X-rays of the gut, have all been negative. The total leucocytes have, however, always been raised—9000 to 12,000 per c.mm. with normal differential count. The count remains high except after a course of penicillin, when it falls to 6000 per c.mm. Coagulation and bleeding times in the intervals are normal. For the last month the patient has been finding it difficult to accommodate his eyes, e.g., he takes a few moments before being able to read his watch. By way of treatment he has had penicillin, streptomycin, P.A.S., and, recently, aureomycin. Streptomycin and P.A.S. disagreed with him and set up diarrhœa, so had to be stopped. He has also been given calcium, iodine, vitamin K, rutin, multi-vitamins, and snake venom. About six months ago he was given a course of tuberculin injections—the hæmorrhages ceased for five months, but recurrence has again taken place. Could you suggest some treatment to stop these recurrent hæmorrhages? What is the prognosis?

REPLY.—Recurrent retinal hæmorrhages in a man of forty raise four diagnostic possibilities: (1) Tuberculous periphlebitis (Eales' disease); (2) diabetes mellitus; (3) vascular hypertension; or (4) one of the primary anæmias. From the account given, only the last would appear to have been eliminated. It would be advisable to have the opinion of an experienced physician on the other three possibilities. It is also important to have a detailed examination of the fundus for arterial and venous abnormalities in the retina. It is exceedingly unlikely that a chronic infective condition—at any rate those seen in this country—would be responsible for recurrent hæmorrhages. The intensive treatment this patient has had with the various antibiotics does not therefore seem to have any justification. There is likewise little to be hoped from the use of calcium and the other agents mentioned. Tuberculin injections would be reasonable if a definite diagnosis of tuberculous periphlebitis were made. The best interests of the patient would be served by suspension of treatment until a clear line of action is established.

PROFESSOR ARNOLD SORSBY, M.D., F.R.C.S.

Persistent Constipation in an Infant

QUERY.—I would be pleased if you could give me some advice on the treatment of constipation in an infant boy aged two years. He was breast fed until the age of nine months. The bowels have always been difficult. He has been encouraged to drink plenty and is having a well-balanced diet. The bowels open every four to five days, and on some occasions an olive oil enema is necessary. He has had the usual mixtures of senna, magnesia, and the like, and recently I have given him atropine and prostigmine orally, without any benefit. The bowels now will not move unless he is given some castor oil or an enema. He has been left alone without medicines for over a week but an enema had to be given to produce a motion. He is otherwise normal. There is no evidence of mental backwardness or thyroid deficiency.

REPLY.—As constipation has been present from an early age the rare organic causes should be considered. Inspection will reveal the presence of anal tags, and rectal examination will exclude narrowing of the outlet. Abdominal distension will be noted if megacolon is present, but sometimes the colon, always relatively long in children, may be exceptionally so and cause trouble by mechanical means. If, as is likely, none of the above conditions is found, it will be necessary to emphasize to the parents that ill-health is never caused by constipation *per se*, and that the bowel can be re-educated to function normally.

Habit training is all important. The child should be placed on the toilet after breakfast quite regularly and with a minimum of fuss, so as to discourage negativism. Up to fifteen minutes should be allowed. Inhibition may occur from the presence of a painful fissure, and this may be treated by the application of anæsthetic ointment. Massage along the course of the colon may help, especially if there is muscular hypotonia. Enemas are best avoided. Rectal instillation of 1 to 2 oz. (28.5 to 57 ml.) of olive oil at night will help to soften the fæcal mass and so make evacuation easier. This is preferable to liquid paraffin by mouth, which tends to become a habit. Violent purgatives have no place in treatment, for if the bowel is emptied by this means it will be about four days before the rectum is again filled, by which time the stool may be so hard that it is painful to pass and inhibition will follow. Diet is important but can be harmful as an excess of 'roughage' can lead to bowel spasm with pain and the production of much mucus, a condition which may be treated with tincture of belladonna and small doses of phenobarbitone. Too much milk will constipate, but prune pulp may have a laxative effect. Drugs will almost certainly be necessary until bowel education has taken place, and small regular doses of laxatives are required. Cascara is useful, as in the following mixture:—

Liquid extract of cascara	15 minims (0.9 ml.)
Liquid extract of liquorice	15 minims (0.9 ml.)
Syrup of orange	15 minims (0.9 ml.)
Chloroform water	15 minims (0.9 ml.)

30 to 60 minims (1.8 to 3.5 ml.) after meals

H. W. EVERLEY JONES, O.B.E., M.B., M.R.C.P.

PRACTICAL NOTES

Treatment of Cutaneous Inoculation Tuberculosis

In reporting eight cases (six of which were doctors) of tuberculosis acquired by skin inoculation, E. R. Grady (*American Review of Tuberculosis*, May 1951, **63**, 526) reviews the methods of treatment. In such cases the lesion may either be localized or may spread, usually by way of the lymphatics to the regional lymph nodes. If the cutaneous lesion and the involved lymph nodes are discrete and small, 'complete and immediate removal is the quickest and surest method of cure'. If the patient has never had streptomycin, or if the infecting organisms are streptomycin-sensitive, a short course of streptomycin or one of the newer anti-tuberculosis drugs is indicated. This should be combined with general measures, such as rest and diet, and while chemotherapy is being given it is wise to excise the inoculation ulcer. If there is no evidence of fluctuation in the lesion, X-ray therapy is of value—it increases the fibrous reaction around the lesion and encourages healing by the formation of scar tissue. If either extensive caseation or liquefaction be present, such diseased tissue should either be removed by excision or evacuated by incision and curettage. 'All surgical procedures except the simplest incision and drainage should be delayed until the systemic reaction in the patient has subsided and until the general condition is good. Streptomycin is beneficial in the preparation of the patient for surgery and in the assurance of good post-operative results'.

Aureomycin for Acute Alveolar Abscess

A comparison of the results of different methods of treatment of acute alveolar abscess in children during the last fifteen years has been made by G. H. Rovelstad and C. R. Castaldi (*Journal of the American Dental Association*, July 1951, **43**, 52). The results are shown in the following table:—

Therapy	No. of cases	Peak temp. F.	Days acute symptoms subsided	Days total symptoms subsided	Percentage when drainage occurred
Heat	16	101.3	2.6	6.9	62
Sulphonamides	27	101.1	2.8	6.7	51
Penicillin	22	100.5	2.0	5.9	31
Aureomycin	28	100.1	1.5	4.0	0

It will be noted that the best results were obtained in those treated with aureomycin, and that in this series 'none were incised for drainage, none were opened through the tooth, and none drained spontaneously'. In other words, it would appear as if early adequate chemotherapy will resolve the infection before an accumulation of pus occurs, and it is suggested that hot applications are therefore contra-indicated with such therapy, as they tend to promote suppuration and abscess formation. To avoid recurrences, however, the source of infection must be removed after the infection is resolved. The ages of the children who received aureomycin, which was given orally in all cases, ranged from three to thirteen years. It is concluded that 'aureomycin offers a distinct advantage to the dental profession because of its mode of administration, its low toxicity, and its extreme versatility. This is especially true in the management of children'.

Corneal Infection with B. pyocyaneus

In a report on eleven cases of infection of the cornea with *B. pyocyaneus* observed at the Moorfields, Westminster and Central Eye Hospital, by John L. Bignell (*British Journal of Ophthalmology*, July 1951, **35**, 419) emphasis is laid on the importance of early recognition of the infection and the value of streptomycin therapy when instituted promptly. In all but two of the recorded cases infection followed the removal of foreign bodies; two sets of four cases came from only two separate industrial sources In most cases penicillin drops had been instilled immediately after the foreign body was removed. The time elapsing between the accident and admission varied from thirty-six hours to ten days. Ulcers with infiltration were present and culture revealed *B. pyocyaneus*. Treatment consisted in administration of penicillin and streptomycin subconjunctivally, and sulphonamides and penicillin systemically. Aureomycin drops were also employed. In four cases the affected eye had to be eviscerated. In one case there was perception of light only in the affected eye after treatment; in three vision was 6/24, 6/18 and 6/36. In the majority of cases the *B. pyocyaneus* proved sensitive to streptomycin, which was employed subconjunctivally, in doses of 0.5 g. daily until the ulcer healed, and in the form of drops until no dead-white infiltration remained. It is stressed that discontinuance of this intensive treatment before the dead-white areas disappear may result in severe recrudescence, which occurred in two cases in the series two to three days after cessation of treatment. Attention is also drawn to the fact that in the two sets of four patients coming from industrial sources

penicillin drops were instilled as a routine at the place of work, and the importance of regular sterilization of bottles containing such drops cannot be overemphasized.

Terramycin in Lymphogranuloma Venereum and Granuloma Inguinale

THE results obtained from the use of terramycin in 20 cases of Frei-positive cases of lymphogranuloma venereum are reported by L. T. Wright *et al.* (*Antibiotics and Chemotherapy*, June 1951, **1**, 193). In the initial stages of the study the dosage was 500 mg. four times daily, but on account of shortage of supplies this was later reduced to 250 mg. four times daily. As there was no discernible difference in the results with the two different dosages, the smaller one eventually became the routine dose. Of the patients in the series, 12 were in the acute stage, whilst eight had rectal strictures with proctitis. In all cases there was 'immediate and rapid improvement in the inflammatory process'. In the cases without stricture the average time for 'resolution of the acute pathology' was 22 days; for those with stricture it was 39½ days. For those with buboes alone it was 18¼ days, whilst for those with proctitis without stricture it was 25 days. Terramycin was discontinued with the disappearance of all objective and subjective symptoms of an acute process. As four cases relapsed soon after cessation of treatment, it is emphasized that treatment should obviously be continued beyond this stage. Reactions consisted of mild diarrhœa in a number of patients, a generalized macular rash in one, and glossitis in another. Equally satisfactory results are claimed by J. C. Whitaker *et al.* (*Ibid.*, p. 208) from the use of terramycin in 5 cases of granuloma inguinale. Dosage was 1 gramme daily, and the duration of treatment ranged from twelve to twenty-six days. The lesions healed promptly in all cases. No toxic effects were observed in any of the patients.

Analgesic Action of Sodium Gentisate

'SODIUM gentisate, when administered orally, is a safe and effective analgesic for the relief of mild and moderately severe pain', write R. C. Batterman, L. S. Kryle and S. Dann (*New York State Journal of Medicine*, May 1, 1951, **51**, 1152), who have tested the efficacy of the drug in 43 hospitalized and 54 ambulatory patients and compared it with the results of aspirin in 35 of the latter group. The ages of the patients ranged from sixteen to eighty years. The hospitalized group received sodium gentisate in dosage of 0.3 and 0.6 g., either as a single dose or repeated several times daily. The same dosage was prescribed for the ambulatory group. In the hospitalized group complete or moderate relief of pain was obtained in 70.8 per cent., slight in 1.1 per cent. and none in 27.1 per cent. In the ambulatory group complete relief was obtained in 15 of 31 patients, and moderate in 16. None of the hospitalized group presented any toxic side-effects; in the ambulatory group 11.1 per cent. complained of side-effects. No difference in the degree of analgesia was noted in the group of ambulatory patients receiving sodium gentisate and those receiving aspirin, but there was a marked difference in the occurrence of toxicity: of the 35 receiving aspirin, toxic symptoms occurred in 14 (40 per cent.). In order further to test the toxicity of aspirin an additional group of ambulatory patients was investigated: toxic manifestations in the form of epigastric or abdominal pain, nausea, dizziness, heartburn, rash, palpitations, elevation of temperature and tinnitus (1) occurred in 10, or 25 per cent. In conclusion it is stated: 'In contrast to aspirin, untoward reactions to sodium gentisate with chronic administration are unusual and insignificant'.

Tobacco and Physical Fitness

THE effect of tobacco smoking upon physical performance has been investigated in 13 college students (8 smokers and 5 non-smokers) by P. V. Karpovich and C. J. Hale (*Journal of Applied Physiology*, April 1951, **3**, 616). The exercise consisted of 'performing on a bicycle ergometer a prescribed amount of work, comparable to a one-mile run on the track, in the shortest possible time'. Two series of experiments were carried out. The first was done on five habitual smokers (average, 10 cigarettes daily). After a preliminary period of training, each man rode the ergometer twice weekly for three-and-a-half months. During the investigation the men smoked as usual, except on the test days, when they did not smoke before the test except on 'smoking' days, when they were allowed one cigarette. Analysis of the results showed that the average time of all subjects was better on non-smoking days, but this was statistically significant for two men only. In the second series of experiments, which continued for seven to ten weeks, the subjects were 3 habitual smokers and 5 non-smokers. There were alternate smoking and non-smoking weeks. During the former the smokers smoked as usual, whilst the non-smokers smoked one cigarette before their rides. There was a statistically significant deleterious effect of smoking on one smoker and two non-smokers. The average

riding time was better on non-smoking, than on smoking, days for all but one man (a non-smoker). This, however, was statistically significant for only three smokers and two non-smokers. Abstinence from smoking for one week showed improvement in a tobacco-sensitive subject, but no effect in non-sensitive ones. It is concluded that 'since a relatively large proportion of an athletic team may consist of tobacco-sensitive men, the non-smoking rule imposed by coaches and trainers on their teams is a wise one'.

Tobacco and Thromboangiitis

'ASTINENCE from tobacco is essential in the treatment of thromboangiitis' write R. W. Gifford, Jun., and E. A. Hines, Jun. (*Proceedings of the Staff Meetings of the Mayo Clinic*, June 20, 1951, **26**, 241), who report an interesting case in which cessation of smoking was followed by complete recovery from phlebitis and thromboangiitis obliterans.

The patient was a thirty-three year old man, a Jew, who complained of pain in the left foot aggravated by walking. There was a history of two attacks of thrombophlebitis, two years, and again six months, before admission. He smoked twenty cigarettes a day. There were attacks of wheezing and coughing, and a year previously he had been told that he had Buerger's disease and should stop smoking. Examination revealed râles in both pulmonary fields; an area of superficial phlebitis with cellulitis in the left leg. Both feet were cold, the right more than the left, and test showed intermittent claudication in the right calf. Test for syphilis, and X-rays of the chest and left foot were negative. A diagnosis of thromboangiitis obliterans was made. The patient received treatment and was urged to give up smoking. Two years later he was readmitted with pain in the right calf and left foot; there had been two attacks of superficial thrombophlebitis in the right calf since the first admission. Smoking had been reduced to 6 to 10 cigarettes daily. During the next year there were four attacks of superficial thrombophlebitis involving the right thigh, calf and ankle. Smoking of 5 to 10 cigarettes daily had been continued. The patient was not seen again until twelve years later, when he came for a general examination. During the twelve-year interval he had abstained from tobacco completely, and there had been no recurrence of phlebitis or intermittent claudication. Examination of the peripheral arteries showed they were all pulsating normally except the dorsalis pedis arteries, which were graded 1 to 2 on the left and 2 on the right. X-rays of the chest likewise revealed no evidence of abnormality.

Discussing the case the authors state that although the cause of thromboangiitis is 'still a mystery', and spontaneous remissions are known to occur, the case under discussion would lend support to the theory that tobacco is more than just an aggravating factor.

Dicoumarol in Gynæcology

A CLINICAL survey has been made by B. E. Urdan and M. Wagner (*American Journal of Obstetrics and Gynecology*, May 1951, **61**, 982) of '900 consecutive major gynecological postoperative cases, in 450 of which Dicumarol was given routinely as a means of preventing any untoward complications from intravascular clotting'. It is emphasized that 'the prerequisites for adequate Dicumarol therapy are a reliable experienced laboratory, prothrombin times determinations taken daily or at least every two days, and individualization of each patient'. Dosage was based upon the 'control prothrombin time' (i.e., the value obtained on the morning of the first postoperative day); if this was 100 per cent. of normal the initial dose was 300 mg. of dicoumarol; if 60 to 80 per cent. of normal, it was 150 to 200 mg.; if less than 60 per cent of normal, it was 100 mg. or less. Maintenance dosage was such as to keep the prothrombin deficiency between 30 and 40 per cent. of normal. Bleeding attributed to 'over-dicumarolization' occurred in seven cases, but in none was it severe, and in every case responded rapidly to 72 mg. of menadione sodium bisulphite intravenously and 30 mg. of 'synkavit' intramuscularly three times at four-hourly intervals. Among the 450 patients in the control group who were not given dicoumarol, there were 31 complications from intravascular clotting: 7 cases of phlebothrombosis, 11 of thrombophlebitis, 9 of pulmonary embolism with infarction, and 4 of fatal pulmonary embolism. Among the 450 patients given dicoumarol there was only one intravascular complication: a case of phlebothrombosis which developed in a patient who was refractory to dicoumarol.

ACTH and Cortisone in Infantile Eczema

THE use of ACTH and cortisone in five cases of infantile eczema, two of which were observed at the University Pædiatric Clinic, Geneva, is recorded by F. Thélin, N. Bovet-Du Bois, and J. Guinand-Doniol (*Praxis*, July 12, 1951, **40**, 580). The children were all under one year of age; two had generalized eczema, two infected generalized eczema, and one confluent eczema of the face and scalp. In all itching was intense.

In one case, a boy of seven-and-a-half months with generalized eczema, ACTH was given in dosage of 5 mg. six-hourly for a week. Itching disappeared in twenty-four hours and the erythema in seventy-two hours. The skin was entirely clear in a week, but there was recurrence after cessation of treatment, which again responded rapidly to ACTH. Relapse again occurred, but following this there was gradual progress towards cure with conservative treatment. The two children treated at the Clinic, one of whom had confluent eczema of face and scalp, were given a dose of 25 mg. of ACTH for performance of the Thorn test; there was marked reduction in the number of eosinophils in the four hours following the injection. Rapid improvement in the children's condition and skin followed the injections, but there was recurrence. Cortisone was then given in dosage of 30 mg. for two days, with again rapid clearance of symptoms, followed later by relapse.

In their concluding remarks the authors state that ACTH and cortisone provide a means for heroic therapy in severe cases, although the results are unfortunately not durable. The measure is not without danger, however, and should not be used except in hospital under strict control.

REVIEWS OF BOOKS

Pharmacology and Therapeutics. By ARTHUR GROLLMAN, M.D., PH.D., F.A.C.P. London: J. & A. Churchill, Ltd., 1951. Pp. 828. Illustrations 104. Price 70*s*.

THE rapid advances in pharmacology and therapeutics of recent years have made the writing of a textbook on the subject an increasingly difficult task. Where there is so much to choose from, to select the essentials and keep these within the limits of a reasonably sized volume is an accomplishment which can be attained only by the expert. And the author must not be merely an expert in pharmacology, he must know exactly what the student requires and how to relate the relevant pharmacological data with its therapeutic applications. Professor Grollman has accomplished this task with consummate skill. He has written a textbook which will obviously become the standard one in his own country, and which will appeal to many of his opposite numbers in the medical schools of this country. Of recent years a number of useful epitomes of pharmacology have been published in this country, but there has been a need for a larger volume which would give the student a correct perspective and allow him to view pharmacology as an integral step relating the physiology of his pre-clinical period with the therapeutics of his clinical stage. This is the task which Professor Grollman has performed so successfully. The book is well up to date, and references, more or less detailed, are made to most of the important therapeutic advances of recent years, e.g., the sulphones, chloramphenicol, aureomycin, terramycin, B_{12}, nitrogen mustard, BAL, and proguanil. The only disappointing feature of the book is that the millilitre has not been adopted as the standard metric measure, instead of the cubic centimetre. An interesting example of how the heresy of yesterday may become the orthodoxy of today, and one which also illustrates how much in line with current thought is the book, is the following reference to chloroform: 'Recent work indicates that the tendency of chloroform to induce damage to the liver and kidneys . . . is not particularly different from that of other anesthetic drugs'.

Textbook of Obstetrics. By JOHN F. CUNNINGHAM, M.D., M.A.O., F.R.C.P.I., F.R.C.O.G. London: William Heinemann (Medical Books) Ltd., 1951. Pp. x and 499. Figures 297. Price 40*s*.

A GOOD textbook for undergraduates should be clear, reasonably concise, dogmatic to a considerable extent, should present the reader whose sense of proportion is understandably imperfectly developed, with a balanced picture of the subject he is studying, whilst at the same time it should stimulate his critical faculties and develop in him the desire to inquire further into some of the problems which the author leaves unanswered. It should, moreover, be thoroughly sound and up to date in its teaching. In these objects the author has succeeded. Read in conjunction with good clinical teaching, it should enable the undergraduate to prepare himself adequately for the qualifying examination in midwifery. It will also provide a good refresher course for the general practitioner. There is a controversial element woven through the text, however. To quote the author 'The methods described and practised are in accordance with the Ethical Standards of the Roman Catholic Church, and it is hoped that they may be helpful to doctors of any denomination who are unacquainted with those standards'. To most practitioners these standards are already well known, many regret their intransigence, and not a few would disallow the author's implicit assumption that Catholic and Roman Catholic are synonymous terms. The book is beautifully printed, extremely well illustrated, and attractively bound.

Antibiotics. By SIR HOWARD FLOREY, M.D., PH.D. F.R.S. Oxford: Blackwell Scientific Publications, 1951. Pp. 35. Figures 22. Price 6*s*.

THIS book is a printing of the 52nd Robert Boyle Lecture delivered in Oxford in 1950. It comprises a brief and interesting survey of the problems connected with the cultivation, isolation, antibacterial action, toxicity, and therapeutic activity of antibiotic substances. There are some interesting illustrations of earlier demonstrations of antibiotic action, which show that the importance of Fleming's original observations lay not in the mere discovery of a substance which killed certain bacteria, but in the phenomenal lack of toxicity of penicillin for animal tissues.

Physiotherapy in Obstetrics and Gynæcology. By HELEN HEARDMAN, M.C.S.P. Edinburgh: E. & S. Livingstone Ltd., 1951. Pp. xii and 228. Figures 94. Price 16*s*.

THE author considers childbirth to be natural when on the physical plane labour is physiological and on the mental plane the mother-to-be is unafraid, reaching the climax of the actual birth fully conscious, confident, and joyous. In

this book she attempts to teach physiotherapists to train their patients to achieve this natural childbirth by antenatal exercises. Her results in a controlled series of 800 labours in trained primigravidæ demonstrate the value of this training. Postnatal exercises are well described, the place of physiotherapy in some abnormalities of pregnancy, labour, and the puerperium is considered, and the rôle of physiotherapy and of electrotherapy in gynæcological disorders discussed. This book may be read with profit by general practitioners and by obstetric and gynæcological consultants, as well as by physiotherapists.

A Textbook of Medical Conditions for Physiotherapists. By JOAN E. CASH, B.A., M.S.C.P. London: Faber and Faber Ltd., 1951. Pp. 350. Illustrated. Price 20*s*.

THE title of this book is somewhat misleading, as the book deals not only with medical conditions, but also outlines their treatment by physiotherapy. Thus it rather falls between two stools, on some occasions the medical conditions being dealt with too briefly, and more often the descriptions of the physical methods to be employed being incomplete. Nevertheless, it is a good book and one which supplies a definite need. It is written in simple language, is easy to read, and should be of considerable value both to the physiotherapy student and the practising physiotherapist.

The Versatile Victorian. By ZACHARY COPE, M.D., M.S., F.R.C.S. London: Harvey & Blythe Ltd., 1951. Pp. xi and 179. Illustrations 10. Price 12*s*. 6*d*.

THE versatile Victorian is Sir Henry Thompson, Bt. (1820-1904), one of the most interesting and, at the same time, curious characters of the Victorian era. Although he was the outstanding genito-urinary surgeon of his time, with an international reputation and an international clientele, he is remembered best for that versatility which has been so aptly chosen for the title of his biography. Of this attribute he had more than his fair share. To have had Leopold I of Belgium, Napoleon III, the Duke of Clarence, Thackeray, and Charles Dickens as his patients is a record which would be difficult to beat. He resigned from the staff of University College Hospital at the age of fifty-four, as his private practice was taking up so much of his time. In addition he was a regular exhibitor at the Royal Academy, possessed one of the finest collections of Nankin porcelain in the country, was a pioneer in poultry-keeping and, according to the 'Encyclopædia Britannica' (11th ed.) 'elevated the giving of dinner-parties into a fine art'. These dinner parties, known as 'The Octaves', were so-called because there were eight guests and a menu of eight dishes. Their status can be judged from the fact that among those who attended them were the Prince of Wales (afterwards Edward VII), Prince George (afterwards George V), Robert Browning, Sir John Tenniel, and George du Maurier. Mr. Zachary Cope has drawn largely upon Thompson's hitherto unpublished reminiscences. This is a book which will appeal to all who are interested in the social and medical history of the Victorian era.

Praktischer Leitfaden der Beruflichen Hautkrankheiten. By PROF. C. CARRIÉ, M.D. Stuttgart: Georg Thieme Verlag, 1951. Pp. 186. Illustrated. Price DM. 2.90.

IN this book the author gives an excellent account of the problems of industrial dermatoses based on considerable experience gained in a highly industrialized part of Germany. Despite frequent references in the text to German legislation and 44 pages devoted entirely to medico-legal and insurance aspects which have no application in this country, the book should be of interest to dermatologists, appointed factory doctors, and industrial medical officers. A good deal of importance is given to skin testing, and a list of concentrations in which test solutions should be used is of value. Some sound advice is contained in the section on prevention.

Your Child Makes Sense: A Guidebook for Parents. By EDITH BUXBAUM, PH.D., with a Foreword by ANNA FREUD. London: George Allen & Unwin Ltd., 1951. Pp. vi and 204. Price 12*s*. 6*d*.

THIS book is in two parts. The first, by Dr. Florence Swanson, deals with the physical development of children; the second, by Miss Buxbaum, with the psychological. Dr. Swanson's chapters are excellent. They not only deal with physical development and its deviations, but introduce many glimpses of the allied mental processes as well. In the second part Miss Buxbaum describes the psychological aspects in greater detail. The material is arranged under simple headings, such as thumbsucking and bladder control, illustrative cases are outlined, and treatment suggested. This book will be of interest to pædiatricians, psychiatrists, and other workers in the field of children. Perhaps the interpretations are too Freudian to be appreciated by the average layman.

NEW EDITIONS

The Essentials of Modern Surgery, edited by R. M. Handfield-Jones, *M.C.*, M.S., F.R.C.S., and Sir Arthur E. Porritt, K.C.M.G., C.B.E., M.CH., F.R.C.S., in its fourth edition (E. & S. Livingstone Ltd., 55*s*.) has been brought up to date in all sections. The chapter on chest surgery, which formerly was the work of the late Mr. Tudor Edwards, has been contributed by Mr. Holmes Sellors: it contains a generous section on malignant disease of the lung; also a section on surgery of the heart which comprises a subsection on the treatment of 'blue babies'. The chapters on the ear, nose and throat, formerly undertaken by the late Mr. Lionel Colledge, have been taken over by Mr. J. F. Simpson. In addition to many other advances included in the new edition is an excellent chapter on chemotherapy which contains detailed particulars of the use of penicillin and sections on the newer antibiotics. As is usual with Messrs. Livingstone's productions, this work is beautifully produced and illustrated—it contains, in all, 641 figures.

Two major additions have been made to *Gynæcological Endocrinology*, by P. M. F. Bishop, D.M., in its second edition (E. & S. Livingstone Ltd., 12*s*.); a new chapter on 'steroid chemistry' and, in the appendices, a 'therapeutic schedule' in place of the list of commercial preparations of sex hormones. Much rewriting has been undertaken, and particularly in the chapter on 'infertility', in which the causes and treatment are discussed, as well as testicular and endometrial biopsy, artificial insemination, and basal temperature charts. Much of this information is based on findings at the Fertility Clinic at Chelsea Hospital for Women, of which the author is Co-Director.

Tuberculosis Among Children and Adults, by J. Arthur Myers, M.D., PH.D., in its third edition (Blackwell Scientific Publications Ltd., 95*s*.). Although containing several uncontroversial chapters by other authors on the modern treatment of phthisis, this does not alter the fact that the book is still mainly of interest because of the approach which Dr. J. Arthur Myers makes to the Public Health problem of tuberculosis. In many places in the United States 80 to 90 per cent. of the population do not respond to the tuberculin test, and among white individuals generally, the level of infection must be lower than in other countries. It is thus possible to envisage a tuberculosis-free human herd, secured by applying a strict 'contagious disease technique' in handling sufferers from post-primary disease, and otherwise centring all activities around the tuberculin reactors, who must be followed up and frequently examined to forestall the active lesions of which they hold the seeds. Of the value or, indeed, safety of B.C.G., Dr. Myers doubts. Such views may not yet be applicable outside the States, but their expression is stimulating. The quality of the X-ray reproductions is not above criticism.

Atlas der Hals-Nasen-Ohren Krankheiten, by C. v. Eicken and A. Schulz van Treeck, in its third edition (Georg Thieme Verlag, Stuttgart, DM 78). This invaluable book is a credit to German oto-rhino-laryngology and should find a place on the shelf of anyone interested in the specialty, however sketchy his grasp of the German language. The Atlas is produced on good quality paper and there are 470 illustrations, most of them in colour; coloured photographs of a high quality are included. Of outstanding interest is a collection of photographs depicting lesions in the nasopharynx, a region of the body often difficult to see by indirect rhinoscopy. In this country electrically illuminated nasopharyngoscopes are not often employed, the patterns obtainable being 'tricky' to use and allowing only a limited area to be viewed. The nasopharyngoscope of Schulz van Treeck used in taking nasopharyngeal photographs is a vastly superior instrument which shows up clearly a very wide field. This can be confirmed from personal experience, as it was demonstrated to the reviewer at the Karlsruhe Congress of 1949. The prototype was then manufactured in the Russian zone and impossible to obtain. It is difficult to single out for special praise any one section, although the various manifestations of tuberculous laryngitis are particularly well illustrated and described.

The American Illustrated Medical Dictionary, by W. A. Newman Dorland, A.M., M.D., F.A.C.S., in its 22nd edition (W. B. Saunders Co., 50*s*.), celebrates its jubilee by appearing in new typography and design, and with many new illustrations and terms representing advances in the different branches of medicine. Other features of the new edition are a preliminary article on the fundamentals of medical etymology, by Professor Lloyd W. Daly of Pennsylvania, and a table of modern drugs and dosage compiled by Dr. Austin Smith, Editor of the *Journal of the American Medical Association*. A copy of the new edition, which is beautifully produced, will be a valuable addition to the medical bookshelf.

The contents of the October issue, which will be a special number devoted to 'Advances in Treatment', will be found on page lxviii at the end of the advertisement section.

Notes and Preparations, see page 299.
Fifty Years Ago, see page 303.

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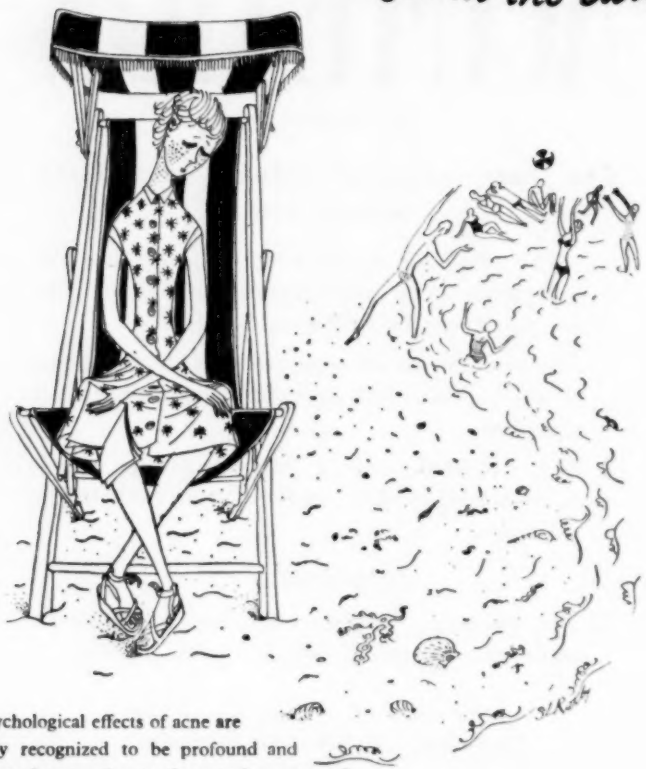

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NOTES AND PREPARATIONS

NEW PREPARATIONS

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'ENTEROCID' SUSPENSION contains 0.25 g. phthalylsulphacetamide per fluid drachm. It is toffee-flavoured and palatable, and clinical trial is stated to have shown it 'to be readily acceptable by even the youngest child'. Enterocid suspension is issued in bottles of 100 and 500 ml. (British Schering Ltd., 229-231 Kensington High Street, London, W.8.)

PLASMOSAN brand polyvinylpyrrolidone solution is a synthetic substitute for blood plasma with a viscosity and tonicity similar to those of blood and exerting colloidal osmotic pressure approximately equal to that of the plasma proteins. It is stated to be physically compatible with blood and plasma in all proportions and to be suitable for use in any condition in which the natural product is indicated. Plasmosan is issued ready for immediate use in cartons containing four 540 m^{l}. standard British transfusion bottles. (May & Baker Ltd., Dagenham, Essex.)

VERILOID (*Veratrum viride*) is an alkaloid mixture which is stated to exert 'a profound hypotensive influence by dilatation of the splanchnic, skeletal muscle, and skin arterioles'. Its use is indicated in the treatment of hypertension. Advantages claimed for the product are: (1) overdosage produces nausea and is thus readily detected, and the optimum dose can be gauged as that 'short of producing nausea yet which results in a satisfactory fall in tension'; (2) the failure of the drug to interfere with normal variations in blood pressure due to changes in exercise and emotional tension, even in the presence of a significant drop in pressure produced by the drug. Issued in scored tablets of 1 mg., in bottles of 100. (Riker Laboratories Ltd., Nottingham.)

Penicillin Price Reductions.—The Distillers Company (Biochemicals) Ltd., announce reductions in the retail prices of the following preparations: 'Crystalline penicillin G', sodium salt and potassium salt; 'Distaquaine' G; 'Distaquaine' fortified; 'Distaquaine' suspension. Full particulars can be obtained from the distributors: Allen & Hanburys Ltd.; British Drug Houses Ltd.; Burroughs Wellcome & Co.; Evans Medical Supplies Ltd.; Imperial Chemicals (Pharmaceuticals) Ltd.; Pharmaceutical Specialities (May & Baker) Ltd. The reduced prices come into force on September 3. (The Distillers Company (Biochemicals) Ltd., Speke, Liverpool 19.)

Surgical Dressings.—A price list of B.P.C./N.H.S. surgical dressings issued July 2, 1951, by Evans Medical Supplies Ltd. can be obtained on application to Speke, Liverpool, 2; 50 Bartholomew Close, London, E.C.1; or from the Glasgow agents, the New Apothecaries Co. Ltd., 59 Glassford Street, Glasgow, C.1.

NEW APPARATUS

The HYPERPHON has been designed for the production of continuous and intermittent ultrasonic waves for the treatment of arthritis and other painful conditions. The instrument consists of a 'sound head' with interchangeable applicator tubes; this sound head is contained in an interchangeable crystal box (for 800 kc. or 1,500 kc.) containing the quartz crystal, which is oil immersed. Different types of facepiece or applicator tubes are fitted to the crystal box for use in various treatments. There is an automatic water cooling unit incorporated in the generating unit, consisting of an electric motor, a pump, and a water container of 3 litres capacity. The 'Hypernon' is designed for use with alternating current of from 110 to 280 volts, the maximum input being 600 watts. The high frequency generating unit and control panel are mounted on a cabinet on wheels. (F. Reiner & Co., Vienna; Edward Gunn Ltd., 11 Argyll Street, Oxford Circus, London, W.1.)

BRITISH EMPIRE CANCER CAMPAIGN

THE 28th annual report of the British Empire Cancer Campaign, covering 1950, represents, in the words of the secretary of the scientific advisory committee, 'a year's solid achievement in the advance of our knowledge of cancer'. When it is realized that the Report is based upon over 200 published articles, it is possible to appreciate the scope of the work sponsored or subsidized by the Campaign. In terms of finance this represents a sum of practically £160,000 paid in grants to hospitals and research workers. The work sponsored by the scientific advisory committee follows two main

CONTINUED ON PAGE 300

lines: (1) the prosecution of fundamental research into the nature of cancer; (2) the application of the knowledge already gained to the recognition and treatment of the individual case. From the point of view of treatment, surgery and radiotherapy still remain the first lines of attack, but definite advances have been made in the field of chemotherapy. The annual contribution of the clinical cancer research committee is always one of the outstanding features of these Reports. This year it is devoted to a statistical analysis of 174 cases of cancer of the lip, 341 of cancer of the mouth and 331 of cancer of the tongue.

MEDICAL FILMS

'*Some Aspects of Accessible Cancers*'.—A series of three films dealing respectively with 'The Skin' (running time 27 min.), 'The Lip, Tongue and Mouth' (running time 24 min.), and 'The Larynx' (running time 22½ min.) was shown recently at the Central Office of Information. These films, which have been prepared by the Ministry of Health, under the general supervision of Sir Stanford Cade, K.B.E., C.B., Mr. Malcolm Donaldson, and the late Mr. G. F. Stebbing, for general practitioners and other professional audiences, all emphasize the need for, and value of, early diagnosis, not only as regards the immediate results of radium and X-ray treatment or surgery, but also the mortality rate. All practitioners should see them; they are a valuable guide to early diagnosis. Three further films, dealing with the rectum, the breast, and the cervix and uterus, will shortly be available. Organizers of shows for professional audiences, who have their own 16 mm. sound projectors, can borrow the films free of charge from the Central Film Library, Government Building, Bromyard Avenue, Acton, London, W.3. (35 mm. sound copies will also be available). Those not having access to projectors should apply to the appropriate Regional Office of the Central Office of Information, or to C.O.I. headquarters, Films Division, 83 Baker Street, London, W.1.

'*Foxgloves in Medicine*' (running time 26½ min.), a colour film prepared by the Wellcome Film Unit for showing to members of the medical and pharmaceutical professions, was exhibited on July 31. Opening with a brief historical survey of the early uses of the foxglove, it proceeds to a description of the discovery of digoxin in the leaf of *Digitalis lanata*, its pharmacological action, and its present-day production. A series of animated diagrams indicating the relation between heart action and electrocardiograms for the normal heart and for auricular fibrillation are shown. The film concludes with a demonstration of the effects of digoxin in two patients, one with mild congestive heart failure and the other with severe congestive heart failure and auricular fibrillation. (Applications for copies of the film should be made to the Wellcome Film Unit, 183/193 Euston Road, London, N.W.1.)

'*Life in Her Hands*' (running time 58 min.) is a Crown Film Unit production, produced in conjunction with the Central Office of Information. The film tells the story of a young woman who takes up nursing after the loss of her husband, and shows the full process of training from the preliminary training school to the completion of the course. Many of the scenes have been shot in a hospital in Southern England. It should do much to further recruiting for the nursing profession. (Crown Film Unit, c/o the Central Office of Information, 83 Baker Street, London, W.1.)

THE BRITISH PHARMACOPŒIA COMMISSION

A supplementary list of approved names, additional to those given in a pamphlet issued in March 1951, has been prepared by the British Pharmacopœia Commission. Copies can be obtained from the British Pharmacopœia Commission, 44 Hallam Street, London, W.1.

PUBLICATIONS

Medicine in Britain, by Hugh Clegg, the fourth edition of which has now been published, is one of the 'British Life and Thought' series published for the British Council. It provides a straightforward account of the organization of medicine in this country, including the method of medical education, which should prove useful to the foreign visitor who wishes to obtain an idea of the subject without going into too much detail. It is difficult to understand why the Royal Society of Medicine should be dismissed with such cursory notice as it receives. The illustrations, with the exception of the frontispiece, are the outstanding feature of this booklet. (Longmans, Green and Co., price 2*s*.)

'*Open-Chain Ureide*' *Sedatives*, by F. G. Hobart, PH.C., gives a brief account of these preparations, with particular reference to two members of the group—bromvaletone and carbromal. According to the author, these drugs 'have not received in the U.K. the attention which they undoubtedly deserve. It would be difficult in the whole field of medicine to cite comparable examples of outstandingly useful drugs which have been so widely neglected'. He concludes that it is in psychosomatic medicine that they 'demand the widest recognition'. (Leonard Hill Ltd., price 3*s*. 6*d*.)

CONTINUED ON PAGE 302

THE CHEMOTHERAPY OF **TUBERCULOSIS WITH P.A.S.**

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Keep off the Grass, by Noel Godber. In spite of the appalling dustcover, this is an amusing, if light, novel which will pleasantly while away several leisure hours. It centres round the fight between two rival manufacturers of hair restorer, and the scenes in the offices of these two magnates (both knighted) of the quack medicine world are among the most amusing in the book. The melancholic advocates of modern cults in literature will probably dismiss the book as 'escapist', but to those who wish to escape to a world free from 'isms' and 'complexes' it can be recommended. It is a suitable book for the train or the seaside. (John Long Ltd., price 9*s.* 6*d.*)

Meister der Chirurgie und die Chirurgenschulen im Deutschen Raum, by H. Killian and G. Krämer. The idea of this compendium, which gives biographies of the occupants of surgical chairs in the leading universities of Germany, Austria, and German-speaking Switzerland during the last two hundred years, is a novel one, making it a useful source of reference. The book begins with the history of the development of German surgery, and ends with an interesting graphic genealogy. Unfortunately, some of the entries are all too brief, and there is a tendency to the use of too many superlatives. A certain amount of repetition is made unavoidable by the arrangement of the text. There is no excuse, however, for such careless mis-spelling as 'Cheseldon, Astly Cooper, Hickmann, Jeakson, Sir James Bart. Paget, and Sir Bart. Spencer-Wells'. The print is small but clear, and there is a useful index. (Stuttgart: Georg Thieme Verlag, 1951, price DM 24.80.)

Understanding Your Child. A Word from Parent to Parent, by Lionel Stebbing, is based on the educational system of Dr. Rudolf Steiner. Different sections deal with the problems during the period from birth to the seventh year, and then from the seventh to the fourteenth year. Other subjects covered are the four temperamental types—the sanguine, choleric, phlegmatic and melancholic—feeding, adolescence, sex questions, the difficult, subnormal and backward child, and there is an interesting chapter on the effect of wireless, television and the cinema on the child. (New Knowledge Books, 28 Dean Road, London, N.W.2, price 5*s.* 6*d.*)

Crichton Royal, Dumfries.—The 111th annual report for the year 1950 records the opening of Ladyfield Villa as the Department of Child Psychiatry and reviews the activities of the Department of Clinical Research. The E.E.G. Department has undergone considerable expansion and has now become the Department of Applied Electro-Physiology. (Secretary, Board of Management, 20 Castle Street, Dumfries.)

The Retreat, York.—The 154th annual report for the year ended December 31, 1950, comments on the place of psychiatry in the National Health Service, on the activities of the 'now very healthy and flourishing' Leeds Regional Psychiatric Association, and on 'Psychological Medicine at large'.

Northern Ireland Hospitals Authority.—The second annual report for the year ended March 31, 1950, is 'a brief record of the voluntary work in a year of a body of thirty-four Northern Ireland men and women, aided, encouraged and supported by several hundreds of other voluntary workers and by eight thousand staff in more than sixty centres'. It reviews the work of the Authority's committees, of the hospitals, of the laboratory services, of the Northern Ireland Blood Transfusion Service, and of the Mental Health Services. R. J. W. Withers, M.D., M.CH., contributes a note on 'The Growth and Development of Orthopædics as a Specialty in Northern Ireland'. With its apt introductory quotations and its warm human undercurrent, this report makes pleasant reading. (58 Howard Street, Belfast.)

The Testing of Hearing Aids, by D. B. Fry and P. Denes, is the NID booklet no. 490 and deals with the procedures at the Technical Department for evaluating the performance of hearing aids. Other subjects discussed are the cost, appearance and portability of hearing aids. The booklet is illustrated and gives full particulars of all the required tests. (National Institute for the Deaf, 105 Gower Street, London, W.C.1, price 1*s.*)

Terramycin is a beautifully produced review of the literature on terramycin, based upon 136 published articles. According to the foreword, this is but a selection made from more than 300 articles which have been published on the subject. All practical aspects of terramycin therapy are fully reviewed. (Antibiotic Division, Chas. Pfizer & Co., Inc., Brooklyn 6, N.Y.)

Trufood Medical Handbook, which has been prepared for the medical profession, contains details of all the Trufood products with tables for everyday general use. Also included are an obstetric table, sections on the growth and development of infants, dentition, digestive disorders, and a useful chapter on the rhesus factor and the treatment of hæmolytic disease of the newborn. (Trufood Ltd., Professional Information Service, Green Bank, London, E.1.)

'*Motherhood*', the seventh edition of Cow & Gate's familiar 'Motherhood' book, pleasantly produced and charmingly illustrated, gives useful information on general hygiene and complications of pregnancy, mother's diet, general care of the baby, breast feeding, the bottle-fed baby, weaning, the premature baby, habit and character training, and minor ailments. The importance is stressed of the mother's seeing her doctor or midwife regularly throughout pregnancy. (Cow & Gate Ltd., Cow & Gate House, Guildford, price 1*s*.)

OFFICIAL PUBLICATIONS

Hospital Morbidity Statistics: A Preliminary Study of In-Patient Discharges, by D. MacKay, Medical Statistician, General Register Office, the fourth publication in the series of 'Studies on Medical and Population Subjects', is described by Sir John Charles in his foreword as 'the first substantive English undertaking in this field'. This stimulating and comprehensive study is of considerable importance in understanding more fully the trends of disease, the social pattern of its incidence, the changes brought about by the development of new diagnostic and therapeutic techniques, and the complex problems of hospital administration. The value of hospital morbidity statistics is briefly discussed, and an interpretation is attempted of figures based on discharges during the first half of 1949 from a limited number of hospitals. The diagnostic pattern of hospital admissions is discussed in infancy, childhood, adult life, and old age; the relevance to hospital administration is considered of differences between hospitals in the average lengths of stay for particular diseases, and the effect is studied of changes in the age structure of the population on hospital requirements in the light of the different common causes of admission at ages under and over forty-five. (H.M. Stationery Office, London, price 3*s*. 6*d*.; by post from P.O. Box 569, London, S.E.1, price 3*s*. 8*d*.)

Results of New Zealand's Use of School Dental Nurses by J. T. Fulton, D.D.S., published as No. 4 in the Monograph Series of the World Health Organization, gives an interesting account of a practice which has been the subject of world-wide controversy among dentists: delegating dentistry to partially trained auxiliaries. The prevalence of dental caries is high in the average New Zealand schoolchild, and a large part of the dental treatment is performed in school dental clinics by dental nurses after two years' training. (Geneva: World Health Organization, 1951, H.M. Stationery Office, price 5*s*.)

THE PRACTITIONER: 50 Years Ago. See page 303

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THE PRACTITIONER

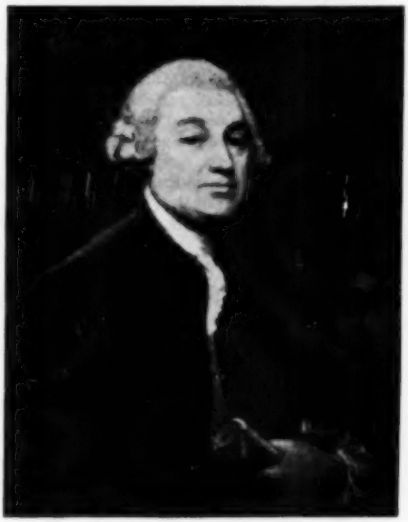
Fifty Years Ago

'And doth not a meeting like this make amends . . .?'—Thomas Moore.

SEPTEMBER, 1901

THOSE who were disappointed last July at having had their yearly brain's-dusting holiday cancelled will read with nostalgic envy the Editor's glowing and humorous account of the British Medical Association's annual meeting at Cheltenham fifty years ago: '. . . by common consent one of the most agreeable within recent memory. This was not due to the attractions of the place where it was held, for these, great as they unquestionably are, were almost neutralised by the relaxing nature of the climate. Nor was it due to the absence of bores, for most of those who haunt these meetings on the chance of being able to snatch the fearful joy of a little notoriety denied them during the rest of the year, were there as usual. What made the meeting so delightful was the magnetic personality of the President, which animated the whole mass, and made of what would otherwise have been a fortuitous concourse of social atoms a gathering of friends in which private jealousies and dislikes were for the moment forgotten. The Association never had a better President than Dr. G. B. Ferguson.' George Bagot Ferguson, M.D., M.Ch., F.R.C.S., Surgeon to the Cheltenham General Hospital, received his medical education at St. Bartholomew's Hospital and took his surgical degrees at Oxford at the age of sixty. He was largely responsible for restoring the popularity of the Cheltenham waters. A cultured personality and an admirable *raconteur*, he died suddenly on November 27, 1906, while performing an operation.

On the topic of 'The Coming Revolution' the Editor lavishes all his customary wit and irony: 'It is evident that a small but active party in the Association are bent on effecting a revolution within that body, and that the great bulk of the members are too indifferent to offer any opposition. . . . They look on at the proceedings of the reforming party as a benevolently neutral person might have watched the Peliades, with the best intentions, chopping up their aged parent and putting the fragments into a cauldron from which they expected him to emerge in a state of perfect repair, and completely rejuvenated. The reforming process was, however, fatal to the old gentleman's constitution.' The social side of the meeting, we are assured, was 'a brilliant success, and even the business side was not without comic relief. The solemn election of Dr. Elliston as a Vice-President of the Association for life has a subtle stroke of humour, in view of the fact that the scheme of reform provides for the extinction of that particular form of honour. Dr. Elliston's life as a Vice-President will, therefore, be a short one; let us hope it will be a merry one. Another amusing incident was the proposal for the appointment of a "Journal Committee" to control the autocratic Editor. It is only two or three years since a committee appointed for this very purpose was abolished, on the ground that the Editor should stand to be shot at without the cover of a Committee!'



Percivall Pott (1714-1788)

Copied by permission from the painting by George Romney in the Council Room of the Royal College of Surgeons of England.

'The miracle season has set in in very lively fashion at Lourdes', concludes 'The Month', quoting from a recent number of 'our Canadian namesake', in which Prof. Osler relates the astonishing story of a young woman who consulted him about a lump in her breast. 'Dr. Halsted removed an extensive growth, as to the cancerous nature of which there was no doubt. Two years ago she consulted Dr. Osler again,

FIFTY YEARS AGO—*continued*

complaining of pain in the side and a loss of vision in one eye. Dr. de Schweinitz reported that she had a sarcoma of the choroid. All the winter she seemed to get worse, and when Dr. Osler went to see her in the early summer she had secondary tumours in the other breast, nodules in the liver, loss of power in the legs, and was suffering a great deal of pain. She was given morphine, and to his astonishment, when he returned he found her rapidly improving. A year later the tumour nodule in the breast had disappeared, she had regained the power of walking, and she was regaining vision in the affected eye . . . Well may Professor Osler say, "Now, these are cases for which you could not do better with treatment by Christian Science, or at St. Ann's, or Lourdes."'

All three 'Original Communications' this month deal with orthopædic subjects. John Poland, Surgeon to the City Orthopædic Hospital, contributes a long paper on 'Separation of the Epiphyses'; Charles A. Morton, Professor of Surgery, University College, Bristol, writes on 'Fractures of the Spine and their Treatment'; and C. H. Bond, Senior Assistant Medical Officer, London County Asylum, Bexley, takes as his subject 'Fractures in the Insane.'

'The name of Percivall Pott (who is the Hero of Medicine in this number) is a household word among surgeons throughout the world, but to most of them even in this country it represents nothing more than a special kind of fracture of the leg and a particular form of spinal disease . . . He was a man of warm affections and sterling kindness of heart . . . Like Dr. Johnson, he did not hesitate to shelter the unfortunate under his roof. He is said to have kept at one time three needy surgeons in his house until he could provide them with the means of earning an independent livelihood.'

R. Tanner Hewlett includes in his review of tropical diseases the epic tale of Walter Reed's experiments on yellow fever in Camp Lazear. 'This epidemic of yellow fever affected one-third of the non-immune residents . . . and was strictly limited to those individuals who had been bitten by contaminated mosquitoes . . . These experiments seem to show indubitably that yellow fever can be conveyed by a particular species of mosquito, and that a certain incubation period must elapse before the insect is capable of conveying the infection to man.' Walter Reed, who was born a century ago on September 13, 1851, obtained his medical degree from the University of Virginia before his eighteenth birthday.

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See "LANCET" July 22nd 1899 p. 219

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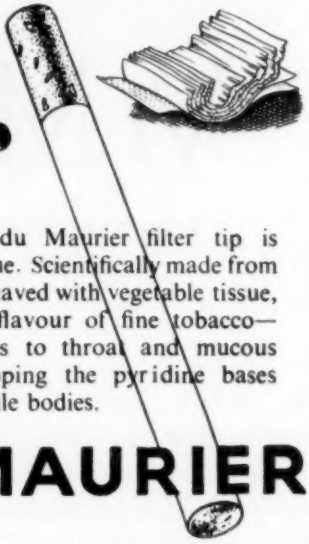

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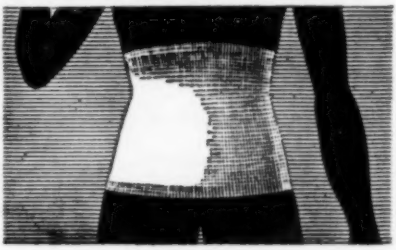

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